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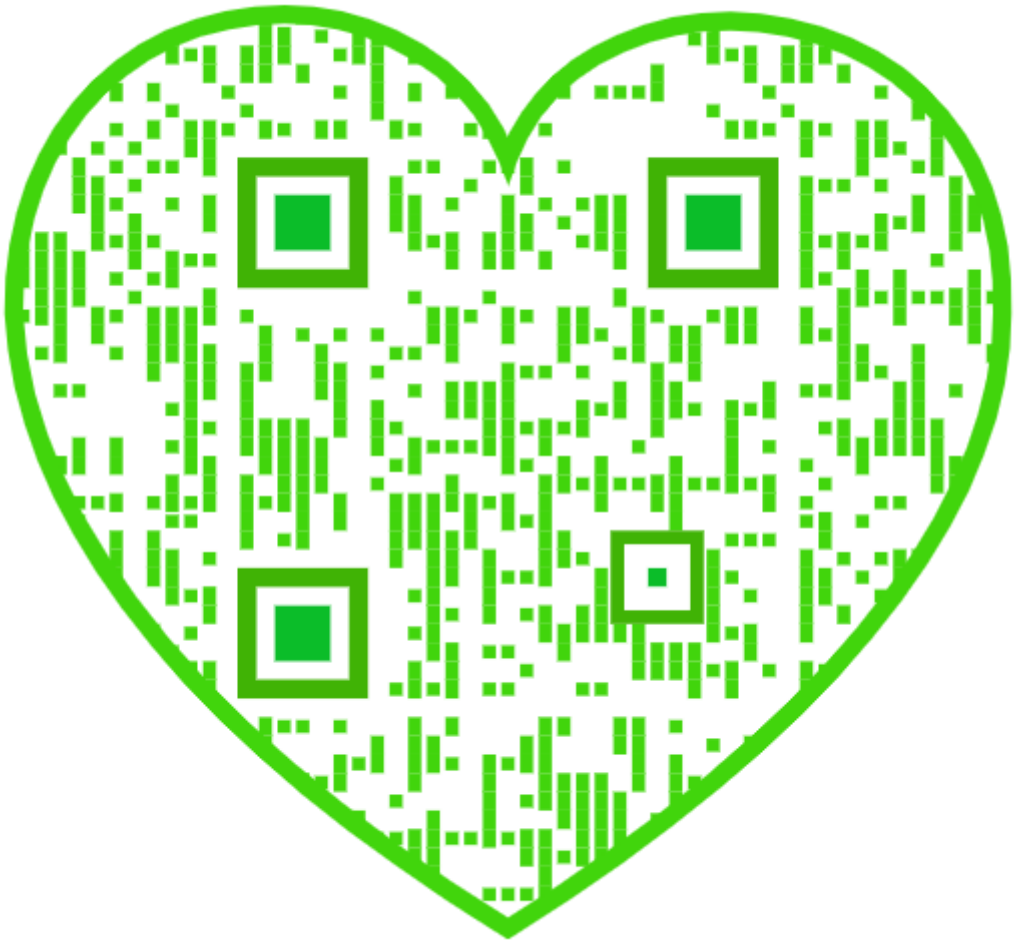

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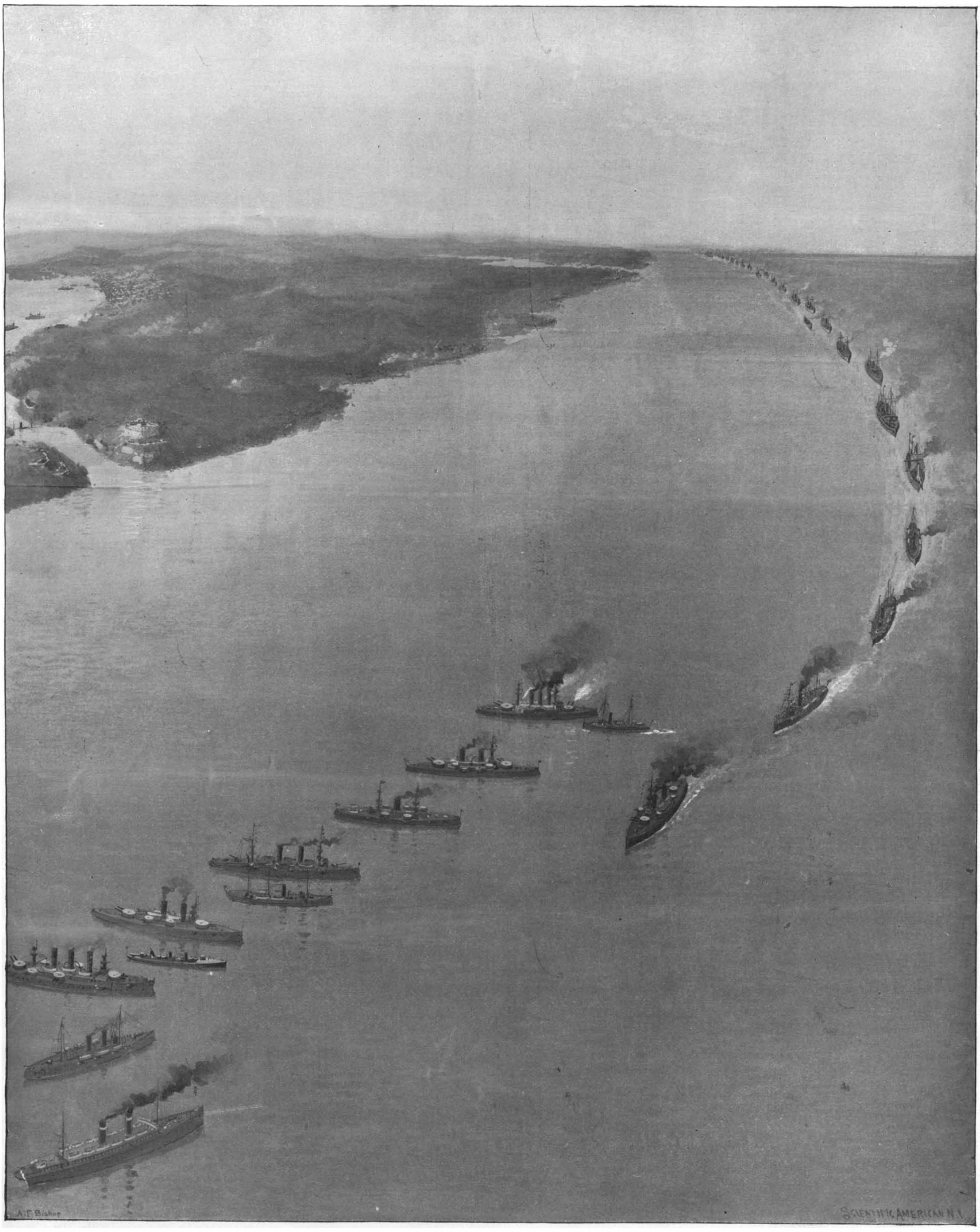

ARRIVAL OF GEN. SHAFTER AND THE UNITED STATES ARMY AT SANTIAGO, JUNE 19.—[See page 8.]

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NEGOTIABLE PAPER FOR PATENT RIGHTS.

In our correspondence column will be found a communication regarding an enactment spread upon the statute books of Tennessee, making it a felony to receive any negotiable paper given in purchase of a patent, or interest therein, unless said paper carries upon its face a statement of the purpose for which it was originally uttered. The penalty is imprisonment for from one to three years.

This is, apparently, the last outcome of a form of special legislation, begun in Ohio, in 1886, and which has been in greater or less degree emulated by thirteen Western and Middle States. The original enactment in Ohio has undergone considerable modification, so that it is much less objectionable than the statute in Tennessee. The validity of such acts has been adversely passed upon as unconstitutional by the United States Circuit Courts for Indiana and Southern Ohio, and by the Supreme Courts of four States.

Per contra, these statutes have been respectively upheld in the courts of last resort in five States. Therefore, considering the conflict of legal authorities, it is desirable the questions involved be brought before the Supreme Bench of the United States for final adjudication.

Unfortunately, any hardship arising from this form of legislation is prone to fall upon innocent shoulders, especially in the case of the Tennessee statute, which makes the holding of a note of ordinary form, given for a patent consideration, an absolute felony. Under such enactment, what recourse has the banker or broker who discounts a note couched in the usual verbiage of such documents, especially if the drawer thereof chooses to repudiate it as having been given for a patent right. As regards any protection afforded the holder of the discounted note, none is apparent, since, in case of swindle, the swindler, as he always has done, unloads and escapes.

HOW THE AX MAY BE MADE THE PRESERVER OF THE FOREST.

In a recent address before the Lumber Exchange of Baltimore, Dr. B. E. Fernow, chief of the Forestry Division of the United States Department of Agriculture, presented many important facts. The title of his address, "The Ax the True Preserver of the Forest," does not appear at first sight to be a topic which would naturally suggest itself to a friend of trees, but Dr. Fernow showed that it was in line with the true principle of forestry. The more trees which lumbermen could cut down and turn into good lumber, the more the lumbermen are pleased, for as a class they are not always in sympathy with the point of view of experts in forestry who wish to preserve the trees. In the past it has been the custom of many lumbermen to look upon the scientific forester as their worst enemy, but now they are coming to see that it is an entirely erroneous view of the case, for without these experts and without legislation all of our forests would be cut down in time, and not only would lumbermen be without occupation, but the great industries which make use of lumber would be paralyzed.

Trees must be cut down and ought to be cut down, not only for commercial and industrial uses, but also for the good of other growing trees, and all that the scientific forester asks is that the cutting should be done judiciously. The ignorant lumberman who does not look to the future cuts down all of his forests at once, while the forester cuts the trees so as to make it a permanent investment. The old fable of the man who killed the goose that laid the golden eggs has been wasted on many lumbermen in the past, but it is to be hoped that the establishment of the School of Forestry in Cornell University, the first in the country, is destined to work a great revolution in the ideas of intelligent people.

We have a remarkable object lesson in forestry in Germany, where it has become almost an exact science. In this country about 11,000,000 acres of forest lands are owned by the state and the yearly revenue is not less than $20,000,000. About 20,000,000 acres of forest lands are owned by private individuals and their profits are almost as great. During the last fifty years at least these revenues have been constantly on the increase, owing to the more intelligent management, irrespective of the market price of material. This is a practical view of the matter which ought to appeal strongly to Americans.

Of course, forestry can only be practiced successfully in a country where forests properly receive adequate protection from fire. In the last few years many farms in New England have been abandoned because the land was no longer regarded as productive, though they would be considered so in other countries where people are less used to an abundant fertility. If, however, they are no longer capable of producing crops, they could be turned to good account by the growing of trees, and many thousands of acres of land that are now useless would thus be made to produce a handsome revenue, while at the same time a large addition would be made to the diminishing timber resources of our country.

DIVER'S PARALYSIS.

Every profession that entails extraordinary conditions and surroundings exacts, ultimately, some penalty, if the warnings of nature are not heeded, and that of divers is by no means exempt. Diver's paralysis has long been recognized, though its occurrence is comparatively infrequent, and divers themselves hold it is directly induced by abrupt change in air and body pressure. A descent to a depth of less than 150 feet is supposed to entail little inconvenience; but every additional yard beyond is regarded with suspicion as a proportionately increasing source of danger. Old men, too, appear to be more prone to these seizures than the young or those in middle life; but the character of the water, per se, and the time of submersion are not considered as vital factors.

Recently, in The Clinical Journal, Frederick Taylor reported a case of this paralysis—the third seizure in the same individual since 1890, the two former, however, being of ephemeral character, exciting no alarm or apprehension. On the last occasion the paralysis came on during operations conducted at a depth of 162 feet. A heavy piece of machinery that was being manipulated slipped and jammed the diver against a beam, at the same time compressing and almost entirely obliterating the lumen of his air pipe; and though he did not become unconscious, the danger was realized and he began to economize the supply of oxygen at his disposal.

After about five minutes, intense pains and noises in the head were experienced, along with evidences of suffocation and a tendency to lose consciousness. In the meantime those on the lighter observed the air-tube was not working, and another diver went down, who by following the life line was able to clear the air pipe, and also to relieve his fellow diver, the latter being at once and rapidly drawn to the surface, the ascent occupying less than a minute. The victim of the accident noted nothing unusual or extraordinary, save he was giddy and excessively nauseated, until an attempt was made to stand, when he became aware of a feeling of numbness in his feet and lack of power and sensation in the legs, which latter, in less degree, also obtained to the arms.

Nine weeks later, there having been no improvement in the meantime, he was admitted to hospital, when it was observed there was notable loss of power in both legs, and partial anæsthesia of the inner surfaces thereof from a point three inches above the ankle to about the same distance above the knees, the areas being roughly symmetrical. The knee jerks were normal, and the muscles, though soft and flabby, apparently were not at all wasted; neither was there any loss of sensation as regards heat, cold or pain.

The sufferer ascribed his condition solely to being hauled to the surface suddenly—to abrupt change in bodily pressure, aided by lack of proper oxygen, resultant upon fouling of the air tube. The degree of immersion he seemed to regard as of little account, even while admitting that a descent beyond one hundred and fifty feet usually caused a sense of "fullness in the head, buzzing in the ears, flashes of light before the eyes, succeeded, perhaps, on coming to the surface, by bleeding from the mouth, nose and ears, and more rarely a condition known to divers as the 'bends,'" which last is generally ascribed to the bands applied around wrists and ankles to render the diving suit watertight. The "bends" is what is known in medical parlance as "wrist" and "foot drop," and in divers usually passes off in twenty-four to forty-eight hours; but this condition is also suggestive that depth and pressure is an integral factor in producing diver's paralysis.

Hitherto, this form of paralysis has attracted little attention, probably because of its generally ephemeral nature; but it appears probable, in the light afforded by the foregoing, that it is cumulative in effects; i. e., each succeeding attack predisposes in progressive ratio to another, until the individual, if he persists in adhering to a diver's calling, especially if he essays unusual or dangerous depths, becomes a permanent and incurable paralytic. Considering also the fact that locomotor ataxia is relatively frequent among divers and now recognized as of primary specific origin, and that disease of this character predisposes to paralytic seizures presenting phenomena that practically parallel those of diver's paralysis, it would seem as if it were an act of folly for those who have ever suffered from specific lues to take up the calling of a diver.

RUSSIA'S STRATEGIC CANAL.

The expenditure for naval work in many countries is far greater than ever before, and the effect of this is shown not only in the laying down of new ships and the building of ordnance, but also in the creation of naval stations at home and naval bases of supply and repair abroad, and the field of activity has even been enlarged so as to admit of the construction of extensive engineering works in the shape of canals for the purpose of the rapid concentration of fleets of war vessels. The most extensive work in this direction is that to be conducted in Russia for connecting the waters of the Baltic and Black Seas. The canal will have a length

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of over 1,000 miles, and the primary object is for strategic purposes, but at the same time it will be of great commercial importance. Beginning at the Riga, the canal follows the course of the river Duna as far as Dunaburg, and from there an excavation is to carry it from Lepel to the Beresina, along this watercourse to the Dneiper and then down this river to the Baltic Sea—over a total length of 1,080 miles. By using the rivers, the artificial construction has been reduced to some 125 miles. At the ends of this canal are the cities of Riga on the north and Cherson on the south. The latter is to become a great naval arsenal. Active operations along the route were to be begun during the last week of June, and it is expected the canal will be completed and open to traffic in four years, at an expense of $97,000,000. The canal is to have a depth throughout its whole extent sufficient to take the largest battleships, and the construction will be of such a character that a speed of six knots an hour can be obtained without eroding the banks by the wash of the steamers. It is estimated that a vessel can pass through the canal in less than a week, and this time may even be decreased, as a much higher speed can be maintained in that part of the canal which follows the natural watercourses. Along its entire length the canal will be lighted by electric lamps so as to permit of travel by day or night.

Strategetically this canal will be of the greatest importance to Russia, as it will enable the combined Black Sea fleet, which now has no outlet, as it is forbidden to pass through the Dardanelles, to be united with the fleets of the Baltic Sea without passing through foreign territory. Russia has now ten armored and nine unarmored ships in her Black Sea fleet which in war time could reinforce the ships in the Baltic Sea; so that in less than seven days her entire fleet could be concentrated in either sea without being exposed at any time to the warships of the enemy.

The commencement of this great strategic canal again brings to notice the necessity for the Nicaragua Canal. The recent feat of the "Oregon" in making the long trip from San Francisco to Key West is remarkable, and it is a powerful object lesson and brief for the construction of a great interoceanic canal under the control of the United States of America, which would bring our Atlantic and Pacific coasts within about one-third of the distance each of the other that they are now. Admiral Walker promises the report of the Nicaragua Canal Commission in the near future. His statement that the project is feasible and that the cost will be about $125,000,000 will help prepare the public mind for the report, which will find American citizens more interested in an isthmian canal than ever before.

OUR COMMERCE WITH CHINA.

The rapid growth of our commerce with China, a subject just now attracting special attention, is shown somewhat in detail by a series of tables in the latest number of The Summary of Finance and Commerce issued by the Bureau of Statistics. These tables show that our exports to China in the year just ending will be about four times as much as in the fiscal year 1890 and more than three times as much as in 1895. The exports from the United States to China in 1895 were $3,603,340, and in the fiscal year which ends with this month promise to be in round numbers $11,000,000. But for the fact that there has been a reduction during the past year in the values of many articles exported, the figures for the present year would be considerably greater than the sum named. The exports of mineral oils, for instance, have increased this year more than 4,000,000 gallons over last year, but by reason of the decrease in price the total cash value falls considerably below that of last year. In nearly all the articles exported from this country to China there has been an increase in quantity in the fiscal year 1898 compared with 1897 or any preceding year. In bicycles, for instance, the exports to China for ten months of the present fiscal year amount to $24,605 against $11,444 in the corresponding months of last year. In telegraph, telephone and other instruments of this class the exports of the ten months are $22,374 against $3,940 in the same time last year. Carriages and cars increased from $1,632 in the first ten months of last year to $28,603 in the corresponding months of this year; fruits and nuts from $13,004 last year to $28,591 this year; canned beef from 90,984 pounds in ten months of last year to 156,718 pounds in the same time this year; bacon from 18,002 pounds to 30,375 pounds; hams from 46,033 pounds to 58,859 pounds; butter from 16,311 pounds to 20,085 pounds, and other articles in like proportion. In cotton cloth there is a reduction of about 12 per cent compared with last year, though the total number of yards this year will be nearly double that of 1896 and more than three times as much as in 1895.

Our sales to China this year will show an increase of more than 300 per cent over those of 1889, while our imports from that country show an increase of but 35 per cent in the same time. Our exports of merchandise to China in the present fiscal year are ten-fold those of the fiscal year 1880, the total for that year being $1,101,383, while that of 1898 is likely to be $11,000,000 in round numbers. Our total exports to all Asia this year will amount to about $45,000,000, being a gain of 10 per cent over last year, more than double what they were in 1890, four times what they were in 1880, and more than ten times what they were in 1870. Of this total of $45,000,000, about one-third goes to China (in part by way of Hong-Kong), one-third to Japan, and the bulk of the remaining third to India and the East Indies. In this calculation of distribution it is assumed that the bulk of the imports into Hong-Kong, which are always heavy, are for China, the Statesman's Year Book saying of the business of that port that it is "virtually a part of the commerce of China."

The following table shows the leading articles exported from the United States to China in the last fiscal year compared with those of the preceding year:

EXPORTS OF DOMESTIC MERCHANDISE FROM THE UNITED STATES TO CHINA IN THE FISCAL YEAR 1897 COMPARED WITH 1896.

	1897.	1896.
Clocks and watches	$21,242	$13,058
Provisions	45,640	50,191
Wheat flour	72,100	45,815
Wood and manufactures of	113,499	154,945
Tobacco, manufactures of	229,956	192,138
Iron and steel, manufactures of	333,007	84,398
Mineral oils	3,371,937	2,166,978
Cotton cloths	7,438,203	3,851,146
All other articles	281,304	359,467
Total	$11,916,888	$6,921,136

The following table shows the total importations into China from all parts of the world by leading articles in the year 1896:

TOTAL IMPORTS INTO CHINA, 1896.

Cotton, raw	$1,056,844
Flour	1,216,568
Ginseng	1,308,578
Machinery	1,668,078
Fish and fishery products	2,527,623
Coal	2,863,701
Woolen goods	4,333,420
Iron and steel, manufactures of	4,981,516
Sugar	5,657,318
Mineral oils	6,751,281
Rice	12,137,759
Opium	23,150,486
Cotton goods	64,028,692
All other articles	39,309,520
Total	$170,991,384

THE HEAVENS IN JULY.

BY GARRETT P. SERVISS.

In the evenings of July the Milky Way becomes again a conspicuous phenomenon, giving splendor to the eastern half of the star dome, which it crosses from north to south like a broad band of sprinkled silver dust. Along its course, beginning nearly under the pole, lie the constellations of Cassiopeia; Cygnus (or the Northern Cross); Lyra, with its great gem of the first magnitude, Vega; Aquila and its curious follower, Delphinus, often called Job's Coffin; Scutum Sobieskii, a famous nest of star clouds; and Sagittarius. As it approaches the southern horizon the vast misty stream breaks into separate wandering channels, inclosing here and there luminous knots, formed by the intertwined radiations of stars too faint and too numerous to be individually seen, and which resemble distant comets, and sometimes are mistaken for them. A very pleasant hour may be spent with a large opera glass exploring the wonders of these brighter parts of the Milky Way. With a telescope the views presented are indescribably magnificent.

"And I said to the Form at my side, 'O Spirit! has, then, this Universe no end?'

"And the Form answered and said: 'Lo! also, it has no beginning.'"

The red star Antares, in Scorpio, crosses the meridian in the south about 9 P. M. in the middle of July. At present it is robbed of its precedence in that quarter of the heavens by the presence of the planet Saturn a few degrees north of it. Nearly overhead at the same hour are Hercules, marked by an irregular square, and the Northern Crown, easily recognizable from its characteristic shape. West of the Northern Crown is the brilliant Arcturus, in the constellation Boötes, and farther toward the horizon glimmers Berenice's Hair.

THE PLANETS.

Mercury having passed superior conjunction with the sun late in June, becomes, in July, an evening star; but it will not be easily visible in the sunset sky until early in August. On the 27th, at 5 o'clock in the morning, Mercury will be in very close conjunction with the first magnitude star Alpha Leonis. Unfortunately, the phenomenon occurs at an hour when it cannot be observed. During the month Mercury moves from Gemini across Cancer into Leo.

Venus becomes every night more admirable as she hangs glowing above the horizon, considerably north of the west point, but gradually approaching true west as the month draws near its close. Venus continues to present a mystery that ought to be solved. Does she rotate on her axis in nearly the same period required by the earth, or is it true, as originally asserted by Schiaparelli and later by Percival Lowell, that her periods of revolution around the sun and rotation about her axis are identical, so that one side of the planet always faces the sun, while the opposite side never sees the solar orb? Upon the solution of this problem appears to depend the answer to the question whether Venus—in size the nearest of all the planets to the earth—is or is not a globe suited to contain inhabitants. There is a fact concerning Venus, revealed by the spectroscope, which seems to militate strongly against the conclusions of Schiaparelli and Lowell, and that is the presence of an abundant atmosphere, containing plenty of watery vapor, surrounding the planet. It has been shown that one consequence arising from the peculiar rotation ascribed to Venus would be that all the water and watery vapor of the planet would be withdrawn to the dark and cold side and there condensed into eternal ice. Recent experiments in the liquefaction of air suggest that the entire atmosphere of a planet having one of its hemispheres always exposed to the unmitigated cold of space might be liquefied, or turned into a snowlike solid, on the sunless hemisphere. But, unless the revelations of the spectroscope have been sadly misread, such a condition of airlessness does not exist on Venus.

Jupiter remains in the constellation Virgo, and Venus gradually approaches him until, at the end of July, they will be not much more than fifteen degrees apart. Between them they share the honors of the evening sky, but while Venus outshines her greater brother, as a telescopic object she is far inferior in interest. Many persons are unaware that with a powerful field glass some (and, in favorable circumstances, all four) of Jupiter's satellites can be seen. They appear as minute specks of light, frequently arranged in a striking row, with the big planet in the midst of them or at one end of their array.

Saturn, in Ophiuchus, near Scorpio, crosses the meridian early in the evening, and is therefore well placed for observation. Its brightest satellite, Titan, is at greatest eastern elongation about 11 P. M., July 9, and at greatest western elongation about 1 A. M., July 18. Its change of place from night to night can be easily followed with a small telescope.

Uranus is on the borders of Scorpio and Libra, preceding Saturn between half and three-quarters of an hour.

Mars, which passes from Aries into Taurus during the month, rises long enough before the sun to be visible as a morning star, but is so remote from the earth that it possesses little interest as an object for amateur star gazers. It can be readily found at the end of the month just above the V-shaped figure of the Hyades and nearly in line with the right-hand branch of the letter.

Neptune is near the star Zeta, in Taurus.

THE MOON.

New moon occurs on the afternoon of the 18th, first quarter on the morning of the 26th, full moon on the afternoon of the 3d, and last quarter near noon on the 10th. It thus appears that July both opens and closes with a waxing moon.

The lunar conjunctions with the planets occur as follows: Mars the 13th, Neptune the 15th, Mercury the 20th, Venus the 21st, Jupiter the 24th, Uranus the 28th, Saturn the 28th.

ECLIPSES.

Two eclipses occur in July, a partial eclipse of the moon, invisible in America, on the 3d, and an annular eclipse of the sun, visible in the South Pacific Ocean and Patagonia, on the 18th.

Meteors radiating from the constellation Aquarius are due on the night of the 28th.

The earth is at its greatest distance from the sun one hour before noon on July 2.

NEW LIGHT WEIGHT UNIFORMS.

The first uniforms of the new style adopted by the War Department for use by the troops in the tropics have been completed and are now on exhibition in the windows of a manufacturing clothier of New York. Thirty thousand of these uniforms are now being made and will be delivered to the army within ten days, and they will continue to be made until the armies for Cuba, Porto Rico and the Philippines are all equipped. The uniforms are made of brown duck woven of a special yarn. The jackets are fashioned after the English hunting jackets, with heavily plaited backs and wide belts which are detachable. They are single breasted, with five buttons, and have two large pockets on each side held by button flaps. In these pockets, where the hunter with a similar suit would carry birds, the soldier can, if necessary, carry a day's rations. The cuffs, shoulder straps and pocket flaps are of the color required to designate the arms of service to which the wearer belongs; blue for the infantry, yellow for the cavalry and red for the artillery. The style of uniform is adapted in part from the uniform of the English army in Egypt, but is better in appearance than any uniform worn by European troops in the tropics, while the material is unique. Ordinary duck used in the trade varies in weight from 8 to 12 ounces to the yard, while the material in the uniforms weighs only 6½ ounces to the yard. The seams are extra lapped and stayed. The material is steam shrunk, so that the wearers may wash their uniforms at any time and will be able to get into them afterward.

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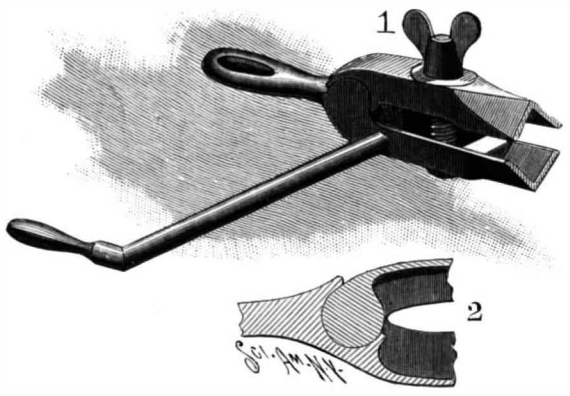
A NOVEL WRENCH.

The illustration presented herewith represents a wrench recently patented by Walter H. Robinson and Edward J. Lawless, 115 Broadway, New York city. Fig. 1 is a perspective view of the wrench, and Fig. 2 is a section taken through the pivoted jaws.

The nut to be turned is received by two jaws so shaped as to form a socket and pivoted upon one another by means of a ball and socket joint, as indicated in Fig. 2. Lips on each side of the joint socket prevent the accidental displacement of the jaws. The movement of the jaws is controlled by a bolt passing through the two members and provided with a wing-nut screw. A spiral spring coiled around the connecting bolt separates the two jaws. The wrench is provided with two handles, at right angles to each other, one extending rearwardly, and used for the purpose of



ROBINSON & LAWLESS' WRENCH.

steadying the wrench when in use, and the other formed on the end of a long arm and projecting laterally, to be used for turning the wrench.

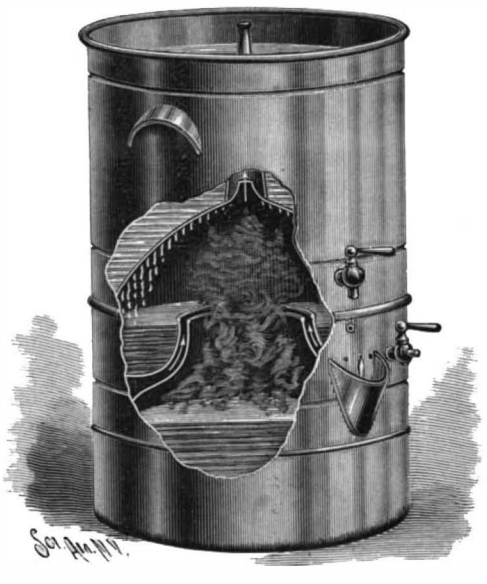
This construction enables the jaws to be screwed securely upon a nut. The long crank-arm, by reason of its great leverage, enables the nut to be started readily, the wrench being in the meantime held in position by the steadying handle. After the nut has been started, the wrench may be easily revolved by means of the handle on the long crank-arm.

Ribs or partitions extend across the jaws, stiffen the members and form a gripping surface, so that the wrench may be used as a vise. It is to be observed that the body of the wrench is formed of two pieces only. This enables the parts to be cast directly in a mould, so that they will fit together without the necessity of machine work.

THE RALSTON WATER-STILL.

Chemists tell us that the food which we take into our bodies is composed, to a large extent, of water. It is, therefore, of paramount importance that the water which enters our systems should, above all things, be pure. But, in order to render drinking water palatable and free from all dangerous bacteria, recourse must be had to some apparatus which will remove the injurious substances.

An ingenious apparatus of this nature is made by the



"RALSTON" WATER-STILL.

Bailey Manufacturing Company, of 54 Maiden Lane, New York city, and is known as the "Ralston New Process Still." The essential parts of this still are a retort and a condenser. The retort constitutes the lower portion of the apparatus and contains the water to be purified. The steam generated in the retort rises and, coming into contact with the water-filled condenser above, drops off into an annular reservoir, as shown in our engraving. This rapid condensation produces a vacuum which causes air previously sterilized to rush into the condensing chamber in the direction indicated by the arrows. The purpose of this sterilized air is to drive off the volatile impurities and to supply oxygen to the condensed steam. The air enters at a feed-cup shown on the outside of the apparatus, passes through steam contained in the sterilizing chamber, and emerges with its organic life destroyed to mingle with the products of condensation. Should the still be neglected for more than an hour, the water in the reservoir flows from an opening above the feed-cup, thus keeping the supply of water in the sterilizing chamber and retort constant. The most striking features of the apparatus are the means for sterilizing air, the inclosed reservoir protected from the contaminating action of the atmosphere, and the device for preventing the retort from boiling dry.

Prize Offered for Matches Without Phosphorus.

The Department of State has received a note from the Belgian minister, dated New York, June 7, 1898, stating that his government has offered a prize of 50,000 francs ($9,650) for the invention of a match paste containing no phosphorus. A copy of the decree, giving terms, conditions, etc., is inclosed. A report on the same subject has also been received from Consul Roosevelt, of Brussels, under date of May 14, 1898. Mr. Roosevelt translates the important clauses of the decree as follows:

A.—The competition is international.

B.—Necessary conditions which paste and matches submitted to competition must fulfill are as follows:

The paste must offer to the action of shocks and frictions such a resistance that dangerous explosions may not be apprehended during the process of manufacture. It must not contain any matter which by its emanations or otherwise may be dangerous during the process of manufacture to the health of the workmen.

The matches must ignite on any surface (even on cloth). Submitted to alternatives of humidity and dryness of heat and cold, in the average limits, they must sufficiently maintain their capacity to easily ignite and not be subject to spontaneous decomposition.

The matches, when struck, must not throw off any substance of a nature to burn persons or provoke fires. They must not discharge toxical fumes. Preference will be given to matches the paste of which does not contain any poisonous ingredient. These matches must also not be susceptible to friction, so that under ordinary conditions they will not easily ignite in the consumer's pocket, and that they may be transported and stored without danger in packings commonly employed in this trade.

C.—Inventors are admitted to competition until January 1, 1899, under the following conditions:

1. They should send, under sealed envelope, a communication giving name, Christian name, and residence, as well as such device as they may have adopted, which will be reproduced on the sample boxes mentioned in 2 and 3.

2. They should furnish 250 grammes (0·55 pound) of paste in a moist state. This paste will be contained in a glass bottle with a ground-glass stopper placed in a sheet iron or tin receptacle kept in a wooden box, of which the sides shall be at least 2 centimeters (0·7874 inch) thick. Between the sides of the box and the bottle there must exist on all sides a free space of about 3 centimeters (1·1811 inches) completely filled with elastic matter, such as straw, hay or wood wool.

3. They should furnish 10,000 matches at least, packed in pasteboard or paper boxes, containing at most 500 matches and bearing upon each box the adopted device. These boxes will be inclosed in a tin case, hermetically soldered all around to protect the matches from external dampness. The case must be packed in a wooden box, the sides of which shall be at least 1 centimeter (0·3937 inch) thick. Communications and packages will be addressed to M. Woeste, state minister, president of the committee, Department of Industry and Labor, No. 2 Rue Latérale, Brussels. These communications and packages can be forwarded any time from now until January 1, 1899.

D.—The inventors whose matches fulfill the aforesaid conditions under Title B will have to give proof that the industrial manufacture of said matches is practicable. They must pledge themselves to the manufacture of at least one million matches on Belgian territory, in some place designated by agreement between the inventor and the committee, and in the presence of the committee or a delegation of the committee.

Weather Stations in the Caribbean Sea.

As a result of the conference between Prof. Willis L. Moore, Chief of the Weather Bureau, Secretary Long, Secretary Wilson and the President, a recommendation will be sent to Congress for an appropriation for the establishment of signal stations at places in the West Indies and South America, in order to forestall the likelihood of danger to the United States vessels from the tropical storms which are frequent in the West Indies during the summer months. Gen. Greely, Chief of the Signal Service, has already secured observatories at Kingston, Mole St. Nicolas and other places. It is proposed to establish signal stations at all important places on the Caribbean Sea. Expert observers will report the conditions to Washington, and dispatches containing information will be sent to Admiral Sampson, Commodore Schley and other commanders. This will be a wise precaution on the part of the government, as these storms are very severe and more to be feared than Spanish guns.

CAR-SEAL BREAKER.

An instrument has recently been patented by Thomas A. Lyendecker, of Laredo, Tex., which is designed to facilitate the operation of breaking car-seals. The tool, as shown in our illustration, has two legs extending parallel to each other and forming an obtuse angle with the handle. The upper and longer leg is

LYENDECKER'S CAR-SEAL BREAKER.

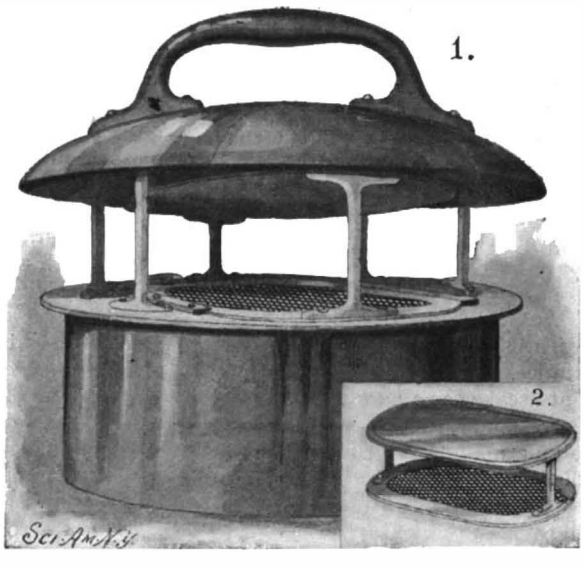
flat, and is formed with a roll at its outer end which constitutes a fulcrum for the tool.

In order to break a seal, the lower leg is engaged with the inner side of the seal, so that a portion of the seal will be received between the two legs. The upper long leg being now in engagement with the side of the car, by drawing the handle outward and downward, the seal will be broken. During this operation the tool swings on the fulcrum formed by the roll.

The instrument is particularly adapted for use in connection with "keystone" seals, although, as the engraving shows, it may be used with the ordinary disk seal.

AN IMPROVED COVER FOR MILK-CANS.

A milk-can cover has been patented by Elmer E. Harvey, Dolington, Pa., which is designed to permit thorough ventilation of the milk while cooling, so as to avoid the disadvantages incurred by hermetically sealing the can while the milk is still warm. The cover also permits the can to be sealed ready for shipment after the milk has cooled. Of our illustrations, the larger is a perspective view of the entire cover and the smaller a perspective view of the ventilating and sealing closures. The cover is provided with a stopper or



A NEW MILK-CAN COVER.

cylindrical main portion surmounted by posts which support a convex shield slightly overhanging the side edges, so as to shed rain away from the stopper. In the top of the stopper is an opening surrounded by a guideway on three sides, in which a ventilating and a hermetic closure may slide. The former closure is made of gauze and the latter is composed of a single metallic plate, both being rigidly connected by bars. By sliding the ventilating closure into the guideway, the orifice is covered so as to exclude dust, yet permitting the circulation of air. By reversing the frame composed of the two closures, the metallic plate constituting the hermetic closure will seal the can. The closures are kept in position by means of a spring plate attached to the stopper at the rear of the guideway.

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THE SPANISH SUBMARINE TORPEDO BOAT "PERAL."

We represent herewith, from La Vie Scientifique, the Spanish submarine torpedo boat "Peral," which was constructed at the arsenal of Caraca and launched October 23, 1887. The boat is cigar-shaped and is 72 feet in length and 9½ feet in width amidships. It is provided with two screws, an electric motor and a torpedo tube.

The first experiments were made with it in February, 1889. The question was not to examine the qualities of the boat as a diver, but simply to ascertain what its nautical capability might be. It was therefore maneuvered near the surface; but, unfortunately, one of the screws suddenly refused to revolve, and a landing had to be made to repair it. Five months later the "Peral" started out for the second time, and on this occasion no accident happened. The boat seems to have behaved pretty well and, as the Cronica General observed, "obeyed its inventor as a slave obeys his master." But the Spaniards are enthusiasts, and, long before the experiments, they had lauded both the boat and its inventor up to the skies.

During subsequent trials for speed, the boat was always meeting with some mishap, and it was even once stranded upon a sand bank. A submarine boat, however, is not designed to be maneuvered at the surface of the water, but is to navigate beneath. It must be confessed that from this viewpoint the experiments were, from all accounts, far from being conclusive. The "Peral" certainly dived, but so few times that the Spaniards had no reason to boast of it. The boat remained submerged for a quarter of an hour, but was immovable and attached to the wharf by a rope. From such an experiment no conclusion could be drawn as to its stability.

In some more recent trials of the "Peral," in the harbor of Cadiz, the vessel moved about upon the surface of the water with a speed of six miles an hour, turning short, stopping and starting with the utmost facility. After a display of her qualities in these respects, her powers of sinking below the surface of the water and rising again were exhibited. Several times up and down she went, sinking until only half of her tower, through which air was drawn, could be seen above the surface of the water. After going through a variety of evolutions, such as turning, stopping and backing while in this position, that is nearly submerged, the cover of the tower was shut down and the boat disappeared wholly beneath the water and remained under the surface for six minutes, only the flag upon the staff being visible.

After a trial of three hours and a half, most of which time the boat was submerged, leaving only the tower or air pipe half way above water, the performances were concluded, the boat rose, and Mr. Peral, the inventor, opened the cover of the tower, and, presenting himself upon the exterior, was received with the greatest enthusiasm by the spectators. It was, says La Ilustracion Española, "a day of glory for the inventor and of prestige for Spain."

It is stated that the Spaniards expect to show the efficiency of the "Peral" in the defense of some one of the ports of Cuba; but, says La Vie Scientifique, "let us hope, in the first place, that it will be possible to use the boat!"

THE SPANISH SUBMARINE TORPEDO BOAT "PERAL"

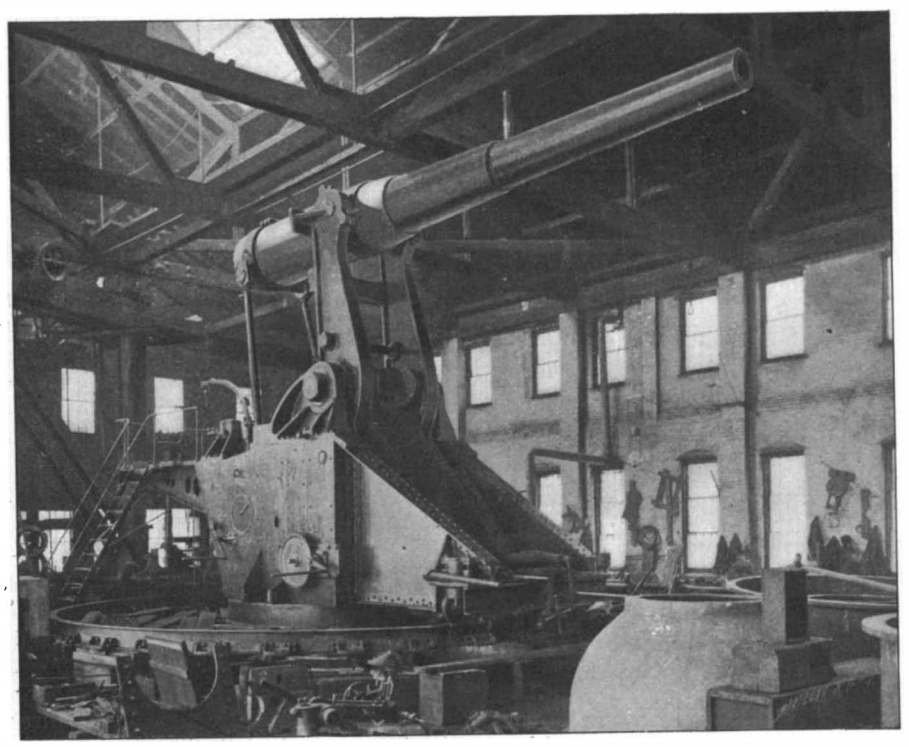
The Loss of the "Maine."

The German naval commander Hermann Gercke publishes in the current number of the official Marine Rundschau an extremely interesting article on the loss of the "Maine." He comes to the following conclusion: "It is difficult, if not impossible, to give a definite answer to the question as to what the cause of the explosion on board the 'Maine' may have been. There is much probability for the assumption that gas was generated from coals or fresh paint, and, becoming in some way ignited, caused an explosion in the magazine; that only one explosion took place, and that no mine played any part in the affair." Commander Gercke continues by saying that if it should be proved that a mine was capable of inflicting such damage as that suffered by the "Maine," extensive changes must in future be made in naval construction, such as the strengthening of ships' bottoms and the changing of the positions of ammunition spaces. For our own part, we cannot coincide with Commander Gercke that there is the least probability of the explosion being due either to gases generated from "fresh paint or coal." To our minds, after the most careful perusal of the evidence given before the United States Naval Court and a minute examination of the drawings attached to the report, it is only possible to arrive at the conclusion that the explosion came from the outside. The evidence and report generally appears to us to finally dispose of any chance of the explosion having occurred on the inside, and from the causes suggested by Herr Gercke. As to the changes suggested by this gentleman in regard to the strengthening of ships' bottoms, we cannot think that any strengthening within reasonable limits would protect a ship from the effect of the explosion of such a mine as, in all probability, has been the cause of the destruction of the "Maine" and the loss of some two hundred and fifty gallant men.—Industries and Iron, of London.

A NEW DISAPPEARING GUN CARRIAGE.

During the last few years great attention has been paid by ordnance experts to the production of disappearing gun carriages and gun lifts for coast defense. The results have been very satisfactory, and among the several types of carriages have been the Gordon, Buffington-Crozier and others. A new "all-around fire" disappearing gun carriage for a ten-inch breech-loading rifle cannon has just been finished by J. B. & J. M. Cornell, of New York, at their West Point foundry. This gun differs in its action and its underlying design from that of the Buffington-Crozier. In both of these carriages the gun is mounted by its trunnions in bearings in the upper ends of two levers. In the former the fulcrums of these levers are stationary, the lower portions of the levers being connected with the counterpoise weight and the recoil-resisting appliances. The result of this construction is that the trunnions of the gun travel in a true circle. The Buffington-Crozier gun, which is described in the SCIENTIFIC AMERICAN for March 14, 1896, is also mounted in the upper end of two levers, the fulcrums of which after fire travel rearwardly along horizontal guides, while the lower ends of the levers travel in vertical guides and then quickly disappear as the line of travel approaches the end of the stroke, the short diameter of the ellipse.

The total weight of the carriage is about 300,000 pounds, which is made up of 155,000 pounds of steel and iron castings, 15,000 pounds of steel and iron forgings, 85,000 pounds of lead counterpoises, 40,000 pounds of structural steel shapes and about 5,000 pounds of brass and other metals. The gun weighs about thirty-three tons, and the shop tests have been highly satisfactory. The gun has now been delivered to the government. The great advantage of this gun is that it can fire in every direction, which will prove very valuable in many locations, as on low sandy spits. The carriage was built in the old historic West Point foundry, located at Cold Spring on the Hudson, which has recently been taken and modernized by Messrs. J. B. & J. M. Cornell. This plant is well known as the foundry at which the celebrated "Parrott" guns were made which played such an important role in the Civil War. The same foundry also built the "Zalinsky" dynamite guns.



A NEW DISAPPEARING GUN CARRIAGE.

Quenching the Soldier's Thirst.

Everybody at all familiar with the actual conditions of an army on the march, says The Independent, appreciates the great practical difficulties in the way of obtaining an uncontaminated supply of drinking water; and one of the most valuable suggestions was made by a gentleman who imagined the possibility of making use of "driven" wells, through which safe water might be obtained, and, fortunately, there is carefully recorded experience to testify to their value.

In the French invasion of China, in 1856-1857, the Chinese, when driven from a place, put poison in the springs and surface wells, and many French soldiers were killed thereby; and at once the engineers made requisition for iron pipes. These were forced into the earth with sledge hammers, and common pumps put on, and an adequate supply of wholesome water drawn. As our authorities are quick to avail themselves of all really fertile ideas, this suggestion will not be lost on them.

Another way of quenching thirst, harmless and efficient and available, when there is strong pressure for uninterrupted action on the part of the soldier, would be to fill his canteen with tea. Of course, this would be made from boiled water; and the addition of a few drops of lemon juice would increase its power of exciting the salivary glands to greater activity, and it is an expedient often resorted to where it is desirable that the least possible amount of liquid should be ingested.

The use of tea is still further approved by the testimony of experience. Sir John Hall, K.C.B., says: "In the Kaffir war (1852) a march was made by 200 men, in which 1,000 miles were covered in seventy-one days, or at the rate of fifteen miles a day, without wine, spirits or beer." Officers in India, when marches were made through malarious regions, had an opportunity to test the virtues of tea. Sir Garnet Wolseley urges its use, and the experience of the Canada lumbermen confirms its value. They spend the winter in the backwoods in the hardest sort of labor, and are exposed to a freezing temperature, and while no spirits are allowed, they have an unlimited supply of tea.

Enough has been said of the horrible sanitary conditions in Cuba in the neighborhood of the cities to warn us that even the driven wells might not serve as an absolute protection where the soil is saturated with infectious material, unless they could be driven far down beyond what must be the inevitable soakage during the rainy season. People forget that the decaying vegetation in a kitchen midden contains many minute organisms, to which the interstices of common earth are as spacious galleries and ample conduits, needing only water to be washed far down into the earth.

FOUR vagrants, says The Railway Review, headed for Chicago, boarded an Illinois Central train at Kankakee, recently, and took passage in a refrigerator car, where they were locked in. When the train arrived in Chicago, a day later, the men were found badly chilled and unable to move.

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THE CUBAN INVASION.

On Tuesday, June 14th, approximately 16,000 men, representing all branches of the land service, were embarked at Tampa on 35 transports, and these with two water boats set sail in convoy guarded by the "Indiana," "Helena," "Castine," "Bancroft," "Morrill" and "Hornet;" a force that was further strengthened off Rebecca Shoals Light by the "Detroit," "Manning," "Osceola" and "Wasp," and off the coast of Puerto Principe by the "Montgomery" and "Porter"—an array of war vessels more than sufficient to cope with the entire force now available to Spain in West India waters.

The impression generally was that the fleet and transports would pass around Cape San Antonio, at the western end of Cuba, a supposition doubtless encouraged by the government for its own purposes. Instead, the voyage was made eastward via the old Bahama Channel, rounding Cape Maysi, which consumed six days—Sampson's blockading squadron was first sighted on Sunday, the 19th. A few men were seized with typhoid fever and measles, doubtless contracted at Tampa; a few mules and horses, confined to the holds, succumbed to heat; and from the time of leaving Egmont Key, at the entrance of Tampa Bay, only a single ship, aside from U. S. men-of-war, was encountered, and this a freighter from Jamaica. Fortunately, even the elements were propitious, pleasant weather being the rule, and only a few suffered from seasickness. Taking all in all, the expedition has been remarkable, first for the utter lack of unpleasant or untoward happenings, and second as being the largest of its kind sent out by any nation since the Crimean war.

On Tuesday the disembarkation of the troops began and was practically completed the following day. Surgedero de Baquiri, seventeen miles east of Santiago, was selected for the initial operations of the army, after due conference with the Cuban leaders in the province and the admiral on station commanding. The advantages of this locality are a wooded plateau of considerable breadth extending along the coast westward without material interruption to Aguadores, and continued again beyond the latter point to the east shores of Santiago Bay; two highways, one along the coast, the other inland, the latter affording superior opportunities, as far as Cuban roads can, for the transportation of light artillery and supply trains; finally, the region provides an abundance of good water, which is a matter of no little moment.

If the inland road is selected, it will be necessary for the troops to either ford or bridge three streams, viz., the Senilla, Guama and San Juan, neither of which, fortunately, is more than a few yards wide; and though at this season all are in "spate," they are seldom more than breast deep at the fording places. As the banks are high, the construction of suitable bridges should entail no great difficulties. The greatest drawback to the march on Santiago, apparently, will be the forwarding of heavy artillery, for not alone is the highway unsuitable to the transportation of such loads, but it is commanded by hills and ridges all the way, and bordered on both sides with heavy brush and jungle, affording excellent opportunities for harassing guerrilla operations on the part of the foe.

It is apparent, therefore, even under the most favorable conditions, the speedy fall of Santiago can hardly be looked for. A well equipped Spanish army of not less than 30,000 men is admittedly encamped in and about the city, and many believe this estimate entirely inadequate.—A gentleman recently arrived from Havana by H. M. S. "Talbot" assures the SCIENTIFIC AMERICAN that the total is not less than 45,000, and perhaps exceeds 50,000. The city itself, aside from its harbor defenses and Cervera's fleet, is well guarded by lines of entrenchments that have been pushed beyond the boundaries and atop of the hills, at every available point and equipped with the latest types of modern ordnance; there are newly erected batteries at the villages of Altares, Juragura and Sevilla; and finally the fortifications at Aguadores are to be reckoned with, and perhaps still more recent defenses than the foregoing, manned and equipped by men and guns from the Spanish fleet. All in all, the ground about Santiago is ideal in the opportunities afforded for defense, and doubtless every foot thereof will be stubbornly contested.

Although it is claimed there are two well armed and equipped bodies of insurgents, numbering respectively 3,000 and 5,000, encamped to the eastward of Aguadores, and another body near Asseradero of 930, all anxious to co-operate with the United States troops, it is probable these figures are somewhat exaggerated; but if true, and counting the marines and sailors that may be spared from Admiral Sampson's fleet, the total forces available to General Shafter do not exceed 26,000 combatants. It is, therefore, a source of satisfaction that three brigades have already been fowarded from Newport News by the Washington authorities, and that it is also proposed to send further reinforcements at an early date. While the press is inclined to underrate the strength of the foe, there are no reasons for believing that the military officers in command are misled, but that they fully appreciate the magnitude of an undertaking like the invasion of Cuba.

A Geographical Commemoration.

The year 1898 will long be noted for the commemoration of three great explorers, the Portuguese Vasco da Gama, the Italian Vespucci and the Russian Deschnev, and a few notes concerning them, giving the results of recent investigations, will, perhaps, be interesting.

It was Bartolomeu Dias who first doubled the Cape of Good Hope, but it was Vasco da Gama who first made use of the knowledge then gained to sail from Portugal around Africa to India, just 400 years ago. The King of Portugal desired to conquer India, and though his council was opposed to it, he set about making preparations for the conquest. Four ships were fitted out under the superintendence of Dias, and the commander-in-chief was Vasco da Gama, who directed the fleet from his flagship "San Gabriel." They sailed July, 1497, and the first landing was made at St. Helena, and the Cape of Good Hope was passed without difficulty. On Christmas Day a coast was seen, and for that reason the place was called "Natal," the name which it still bears. He made other landings on January 6 and 22. He reached Melinda on April 15, and on April 24 he started for India under the guidance of an Indian pilot, whom Gama had procured from the ruler of Melinda through fraud and violence—methods which were not unknown in the Iberian peninsula even in those days. On May 20, 1498, Gama anchored in Calicut on the western coast of the Indian peninsula. He stayed in India until the 5th of October and then sailed westward. The trip back to Africa took three months, and it was not until the 20th of March that the Cape of Good Hope was rounded again, and it was not until the end of August or beginning of September, 1499, that what remained of the expedition again anchored in the harbor of Lisbon. The career of this explorer was tarnished by a series of outrages which completely undermined the dominion which the Portuguese founded in India. "Nevertheless, in its relation to the world at large," says Natural Science, "the achievement was one scarcely inferior to the slightly prior discovery of the new world. It forms an absolute turning point in commercial, economic and political history of Africa and Asia." The four hundredth anniversary of the voyage was celebrated at Lisbon, May 7th to the 20th, an exhibition being held there. The voyage itself did not effect any extension of our knowledge of the geography of India other than a more exact determination of the distance between Africa and India, but the enthusiasm with which his achievement was hailed in Portugal was for a long time of immense influence on the development of commerce and navigation. Not only single vessels, but whole fleets were manned and sent to India by the route that Gama had opened. As a result, the wave of Portuguese exploration and geographic discovery passed rapidly through the Indian Ocean to Ceylon, the Sunda Islands and Malacca; to Socotra and Ormuz, and thence to the interior of the Red Sea and Persian Gulf; from Malacca to the Moluccas, China and Japan. Among the chief conquerors and explorers we may recall the well known names of Tristão da Cunha, Affonso d'Albuquerque, João de Castro and Ferdinand Magellan; and not less immortal is the name of Camoens, who sang the story of his country's deeds while banished to the distant gardens of Macao.

The third congress of the Italian Geographical Association was held at Florence during the week beginning April 12. The proceedings of the congress included the celebration of the four hundredth anniversary of the discoveries of Toscanelli and Vespucci. As to the forename "Amerigo" of the latter, there has been much dispute, and there have not been wanting geographers to take opposite views and say that this name was really "Alberrico," and that he changed it himself or it was changed by his friends to "Amerrigo," in order to make it resemble more closely "Amerrique," which is said to have been the aboriginal name of the tribe of Indians living in Nicaragua discovered by Columbus. Fortunately the explorer's register of baptism has recently been discovered at the church of San Giovanni, at Florence, and is given in full in the SCIENTIFIC AMERICAN for March 19, 1898. Vespucci's claim to be the discoverer of America rests chiefly upon his own word, and, unfortunately, contemporary history is silent regarding the alleged voyage, and he was busily engaged at Seville and San Lucar fitting out the fleet at the time when he alleged he made his remarkable voyage. He did go to America with three subsequent expeditions, concerning each of which he wrote a narrative.

It is stated that Martin Waldseemüller, in his "Introduction to Cosmography," 1507, first proposed the name "America" for the western continent, and in 1510, in a manuscript map of Glareanus, we find the legend "Terre America." We have already illustrated in the number cited above the interesting portrait of Amerigo Vespucci recently discovered.

The third notable explorer is Deschnev, the Cossack, who sailed in 1648 from Kolyma, past the northeast point of Asia down to the mouth of the River Anadyr, on the Asiatic shore of the Pacific, thus being, it is supposed, the first European to sail down the strait afterward named after Bering, and to prove not merely the possibility of a northeast passage, but the more important fact of the separation of Eurasia and America. It is a curious fact that, for many years, the exploit of Deschnev was unknown to the Russian authorities, but now a statue is to be erected to him at Chabarowsk, on the Amur, and the name of East Cape is to be changed to Cape Deschnev, so that the three notable explorers are to be commemorated by the nations to which they belong, for the real or supposed discovery of the route to the East and West Indies and of the northeast passage.

Recent Comets.

BY WILLIAM R. BROOKS, M.A., F.R.A.S.

On June 11, a comet was discovered at the Lick Observatory by means of photography.

Mr. Codington was exposing a plate for the photographic registration of some celestial objects, when, upon developing the same, a streak of light was found thereon, which indicated the presence of a comet. This was confirmed by visual observation with the telescope.

The comet was observed by the writer on June 14, in right ascension, 16 h. 14 m. 40 s.; declination south, 27 deg. 7 m.

It was in the constellation Scorpio, near the bright red star Antares.

Daily motion, about three-quarters of a degree in a southwesterly direction.

The comet is a moderately bright telescopic object.

My latest observation was on June 17, when its position was, right ascension, 16 h. 4 m. 2 s.; declination south, 29 deg. 1 m. On July 1 its approximate place will be right ascension 15 h. 19 m.; declination south, 36 deg. 10 m.

ENCKE'S COMET.

This well known comet was recently detected at its present return by Tebbutt, in Australia. It has the shortest period of any known comet—three and one-third years. The comet passed perihelion on May 24, and was then in good northern declination, but too near the sun to be seen—setting in bright twilight.

Several attempts were made to detect it at this observatory, but the above conditions were unfavorable. From now on the comet may be well observed in southern latitudes.

WOLF'S PERIODIC COMET.

This comet was detected by Hussey, of the Lick Observatory, on its present return, on June 16, in right ascension 2 h. 16 m.; declination north, 19 deg. 42 m.—very near to the predicted place as indicated by the ephemeris. It is in the eastern morning sky.

The following ephemeris will show its course through the heavens for the next few weeks:

	R. A. h.	R. A. m.	Decl. N. deg.	Decl. N. m.
June 27	2	48	+20	9
July 1	2	59	20	11
July 9	3	23	20	4
July 17	3	47	19	41
July 25	4	9	19	0
July 29	4	21	18	33

On June 14 a faint comet was discovered at Lick Observatory by Perrine, in right ascension 3 h. 29 m.; declination north, 58 deg. 36 m. It is best observed in the northeastern morning sky.

The comet was observed by the writer with the 10-inch refractor of this observatory on June 17, thirteen hours, in right ascension 3 h. 46 m. 30 s.; declination north, 58 deg. 2 m.

Its predicted place on July 2 is, right ascension 5 h. 10 m.; declination north, 52 deg. 27 m.

It is slowly increasing in brightness.

Smith Observatory, Geneva, N. Y., June 20, 1898.

The Current Supplement.

The current SUPPLEMENT, No. 1174, has a number of articles of interest. "The Causes of the Explosive Effect of Modern Small Caliber Bullets" is very timely, in view of the fact that the Spaniards use Mauser rifles and that both our navy and army are also equipped with guns firing small caliber bullets. "The Competition of Automobile Hackney Carriages" illustrates the most modern types of automobile carriages which now ply for hire in Paris. The article shows that in Paris, at least, the horseless carriage industry is on a firm foundation. An important paper by Mr. James W. See on "Patents" deals with modifications, divisional patents, solicitors, contingent fees, infringements, government divisions, copies of patents, digests, foreign patents, etc. "An Apparatus for the Production of Acetylene Gas" describes a number of modern forms of apparatus for producing the new illuminant. "Liquefied Air for Industrial Purposes" describes the devices of M. Pictet and M. Cailletet. "A New Railroad Station in Dresden" describes one of the finest railroad stations in the world. "Don Carlos" gives some particulars of the life of this interesting and picturesque pretender to the throne of Spain. "Indian Hemp" is an article by Dr. G. Archie Stockwell. "The Dussaud Téléoscope" describes an interesting French invention.

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Correspondence.

Negotiable Paper in Tennessee.

To the Editor of the SCIENTIFIC AMERICAN:

The writer of the article on "Negotiable Paper for Patent Rights," which appeared in the SUPPLEMENT of June 11, overlooked the fact that the odd statutory provision, making it a penal offense to fail to insert in a note given for a patent right, words showing that it is given for a patent right, has crept into the statutes of this State (Tennessee), and that, too, as late as the legislative session of 1897. Chapter 77, Acts 1897, provides as follows:

"Hereafter it shall be unlawful for any person, either in his own behalf or in a representative capacity, to take or receive for the sale of a patent right or any interest therein, a note or other written security given for such right or any interest therein, unless it shall clearly appear upon the face of the note or other security that the same is given in the purchase of a patent right or an interest therein."

The remarkable feature of this act is that, by the second section, the offense is made a felony and punishable by imprisonment in the penitentiary not less than one nor more than three years.

We already had a statute making a note subject to all defenses in the hands of an otherwise innocent purchaser, where it contains words showing that it was given for a patent right. T. A. STREET.

Nashville, Tenn., June 14, 1898.

Instinct or Superstition?

To the Editor of the SCIENTIFIC AMERICAN:

Three days ago, one of our maids came to tell us that the cockroaches were streaming out of the houses in one of the streets of our village, marching in whole companies across the backyards and gardens toward the shores of the lake.

The village where we live consists of about 400 cottages, mostly built of logs and thatched with straw. They are built on both sides of a street about two miles long and 400 feet broad, in nests of four homesteads each, separated by cross streets some 40 feet broad. The village is divided into two unequal halves by the gardens and courts surrounding our house, the house of another gentleman whose property adjoins ours, and by a large common or square, where the village church, schoolhouse and a few other buildings are situated. On the south, the long line of homesteads is bordered by an open field; on the north, by the shores of a long, but shallow lake.

We have had a very dry spring this year, no rain having fallen for nearly three weeks, so that everything was very dry. The weather has been unusually hot (up to 40° Reaumur in the sun), and only during the last three or four days a north wind has rather cooled down the atmosphere.

The strange migration of cockroaches that I have mentioned took place at about 11 A. M. on the 31st of May. These nocturnal insects infest the wooden cottages of our peasants in vast numbers, hiding in the chinks and crevices of the walls and ceilings or behind the large stoves, and sallying out at night in search of food. Whether from a kind of respect for their usefulness as scavengers, or rather from a general dislike of killing any living thing that is so characteristic of the Russian peasant, our villagers never destroy these pests, and it is a perfect torture for any one of a sensitive constitution to pass a night in a peasant's cottage, because of the swarms of cockroaches that race over the floor, walls and furniture as soon as night sets in.

Constant intimacy with these insects has made our peasants thoroughly acquainted with their habits, likes and dislikes, and they have come to put a faith in many of their observations that seems mere superstition to less habitual observers. Among these beliefs the most common is, that cockroaches have an infallible prescience of the immediate fortunes of the homestead they choose to inhabit. Any unusual activity in the cockroach colony, or a sudden reduction of their numbers, is interpreted as a certain sign of some impending danger to the family or the home. When, however, a general migration of cockroaches takes place—especially in the day time—our peasants have always understood it to portend nothing else than a destructive fire.

Consequently, when I was told that the roaches were marching to the lake in broad daylight three days ago, we had a lively discussion of the subject at our family lunch, and the general opinion was, that such a superstition could have no real foundation, unlike the well known one of rats leaving an unsafe ship in port; for a fire, especially in summer, is generally the result of an accident that has no preceding or gradually developing cause. Still, I was interested enough to inquire in what particular part of the village this migration had been observed. I was informed that the stampede was by no means general, but was confined to a row of cottages in the extreme eastern end of the main street.

To-day, June 2, at 4:30 P. M., we hurried out of our house at the cry that fire had broken out in the village, and the great bell of our church was tolling its rapid and violent appeal for help as I drove our fire-engine in the direction of a great column of black smoke ascending in the eastern end of our village.

After a battle with the flames that lasted for about three hours, our four engines managed to arrest and control the conflagration; and as I write, the embers of more than thirty houses, barns and farmyards are yet sending up lurid clouds of smoke and steam in the soft summer night.

The cockroaches had left precisely those cottages that have just been destroyed, and are now enjoying the fruits of their foresight in other houses, many of the dwelling houses on my own estate being perfectly infested with them.

As a constant reader of the SCIENTIFIC AMERICAN, I thought this communication might be of general interest. Perhaps others may have heard or witnessed facts that may help to give an answer to the question that heads this letter.

I must add that the cause of the fire has not yet been ascertained, but as it originated in the porch of a cottage where an old woman was left in charge of six small children (the rest of the family being at work in the fields), it was very probably due to some of the children playing with fire.

NICOLAS SHISHKOV, J. P.

Archangelskoe, near Simbirsk, Russia, June 2, 1898.

How Firecrackers are Made.

Mr. John Goodnow, Consul General of the United States at Shanghai, has sent to the Department of State at Washington an interesting report on the method used in the manufacture of firecrackers and the extent of this industry in China. During the year ended June 30, 1897, there were exported from China 26,705,733 pounds of firecrackers, valued there at $1,584,151 in gold. The largest part of the total shipment was sent to New York, to be in turn shipped throughout the United States, to give the patriotic American boy the means by which he can show his appreciation of the Fourth of July.

The exports represent only a small fraction of the quantity of these small explosives manufactured in China, for the use of firecrackers, says Mr. Goodnow, "is universal in China, and has been as far back as history records." "It is most probable that in the beginning they were used to frighten away evil spirits; now they are most frequently an expression of good feeling or of ceremonious compliment. They are used at weddings, births and funerals; at festivals; religious, civil and military ceremonies; at new year; to salute persons about to make a journey; and, in fact, on all occasions out of the ordinary routine."

According to Mr. Goodnow, there are no large manufactories. The crackers are made in small houses and in the shops where they are sold. In the latter places the proprietor of the shop, his wife (or wives) and children do the work. No record is kept of the number made and sold, and no estimate of their cost is possible.

In making crackers, only the cheapest kind of straw paper which can be produced in the immediate locality is used for the body. A little finer paper is used for the wrapper.

The powder is also of the cheapest grade, and manufactured in the locality where used. It costs 6 to 7 cents gold per pound. For the fuse, a paper (called "leather" in Shanghai) is employed, which is imported from Japan, and is made from the inner lining of the bamboo. In other places a fine rice paper is used, generally stiffened slightly with buckwheat-flour paste, which, the Chinese say, adds to its inflammability. A strip of this paper one-third of an inch wide by fourteen inches (a Chinese foot) long is laid on a table and a very little powder put down the middle of it with a hollow bamboo stick. A quick twist of the paper makes the fuse ready for use.

Mr. Goodnow says that it is not easy to persuade the Chinese to exhibit their modes of manufacture to a foreigner, but Vice-Consul Williams saw the work going on, and thus describes it:

The straw paper is first rolled by hand around an iron rod, which varies in size according to the size of cracker to be made. To complete the rolling, a rude machine is used; this consists of two uprights supporting an axis, from which is suspended by two arms a heavy piece of wood, slightly convex on the lower side. There is just room between this swinging block and the top of the table to place the cracker. As each layer of paper is put on by hand the cracker is placed on the table and the suspended weight is drawn over the roll, thus tightening it until no more can be passed under the weight. For the smallest "whip" crackers, the workman uses for compression, instead of this machine, a heavy piece of wood, fitted with a handle like that of a carpenter's plane. In filling crackers, 200 to 300 are tied together tightly in a bunch. Red clay is spread over the end of the bunch, and forced into the end of each cracker with a punch. While the clay is being tamped in, a little water is sprayed on it, which makes it pack closer. The powder is poured in at the other end of the cracker. With the aid of an awl the edge of the paper is turned in at the upper end of the cracker, and the fuse is inserted through this.

The long ends of the fuses are braided together in such a way that the crackers lie in two parallel rows. The braid is doubled on itself, and a large, quick-firing fuse inserted and the whole bound with a fine thread. The bundle is wrapped in paper and in this shape sent to the sea coast.

A variety of cracker I do not remember to have seen in the United States, continues Mr. Goodnow, but which is popular here, is the "twice sounding." It has two chambers, separated by a plug of clay, through which runs a connecting fuse. There is also a fuse extending from the powder in the lower chamber through the side of the cracker. When the cracker is to be fired it is set on end and fire set to the fuse. The powder exploding in the chamber throws the cracker high in the air, where the second charge is exploded by fire from the fuse extending through the plug between the two chambers. In the manufacture of these the clay is first tamped in with a punch, to form the separating plug. The lower chamber is then loaded with powder and closed by turning over the paper at the end. The upper chamber is loaded and closed with clay. A hole is punched in the side of the lower chamber with an awl and the fuse inserted through this opening.

At Canton the ordinary size cracker (1½ inches long by a ¼ of an inch in diameter) costs 1 tael (62 cents) for 10,000 for export. At Hankow the best quality of this size cost 1 tael for 5,000; while of the second quality 20,000 can be bought for 1 tael. At Chungking 15,000 of the ordinary crackers can be bought for 1 tael. At Shanghai 1 tael will purchase 5,000 of the ordinary size, while the largest sell for $5 per thousand. These prices are probably only a shade above the actual cost of manufacture. The small manufacturers sell to Chinese compradores, who buy as agents of foreign firms and ship the crackers in bundles to the sea coast, where they are packed in boxes which cost about 4 taels ($2.50) per hundred, and hold 250,000 firecrackers.

Aside from the fact that all the material used is native and produced where the crackers are manufactured, and that transportation does not enter into cost, the wonderful cheapness of manufacture is accounted for by the kind of labor used and the wages paid. The items of cost of plant and interest on it are eliminated by the fact that the crackers are made in the homes of the workmen and in the shops where they are sold. The hours of labor are from 6 A. M. to 11 P. M., and there are seven working days in each week. Four-fifths of the crackers consumed in China are made by the families of those who sell them, these people, of course, receiving no wages. Of the paid work, a very large proportion is done by women and children who are paid by the piece. It is estimated that thirty women and ten men can make 100,000 crackers per day, for which work the women will receive 5 cents each and the men about 7 cents each. An apprentice is bound for four years, and during that time receives only his board. At the end of that period he will receive, if he is a fairly good workman, 150 cash per day, or 7 cents in United States money. An expert at the trade receives 200 cash per day, or 10 cents gold.

Workmen at this trade receive about the average rate of wages paid here for common labor. The trade is considered unhealthy and dangerous, and therefore not desirable.

An Electrical Exhibition in Como in 1899.

Como, Italy, will ever be famous as the birthplace of Alessandro Volta, and it is gratifying to note that this city is preparing to worthily celebrate the hundredth anniversary, which will take place in 1899, of the invention of the Voltaic battery. The International Electrical Exhibition will be opened at Como on the 15th of May and will continue open until the 15th of October, and annexed to it will be the National Exhibition of the Manufacture of Silk and an International Exhibition of the Machinery, Preparation and Process of Working the Same. As Como is in the heart of an important silk district, the latter part of the exhibition cannot fail to be of interest. Foreign electricians are invited to the Electrical Congress which will be held, and every opportunity will be given them for the discussion of all the papers read.

Como is beautifully situated on the lake of the same name, at the foot of the Alps, and easily reached from Milan or Switzerland. This is an excellent place for holding an exhibition, owing to its central location. Italy has abundant hydraulic power, which should induce manufacturers to try to develop it. There will be exhibited Volta's original apparatus, his manuscripts, autographs, portraits, etc. An attempt is to be made to illustrate the history of electricity during the century. Particular attention will be paid to the methods of teaching electricity. The bulk of the exhibits will fall into the twelve sections into which they are classified.

IN Paris accident insurance policies are issued guaranteeing the holder against the consequences of the damage he may inflict on others. They are taken out chiefly by cab drivers.

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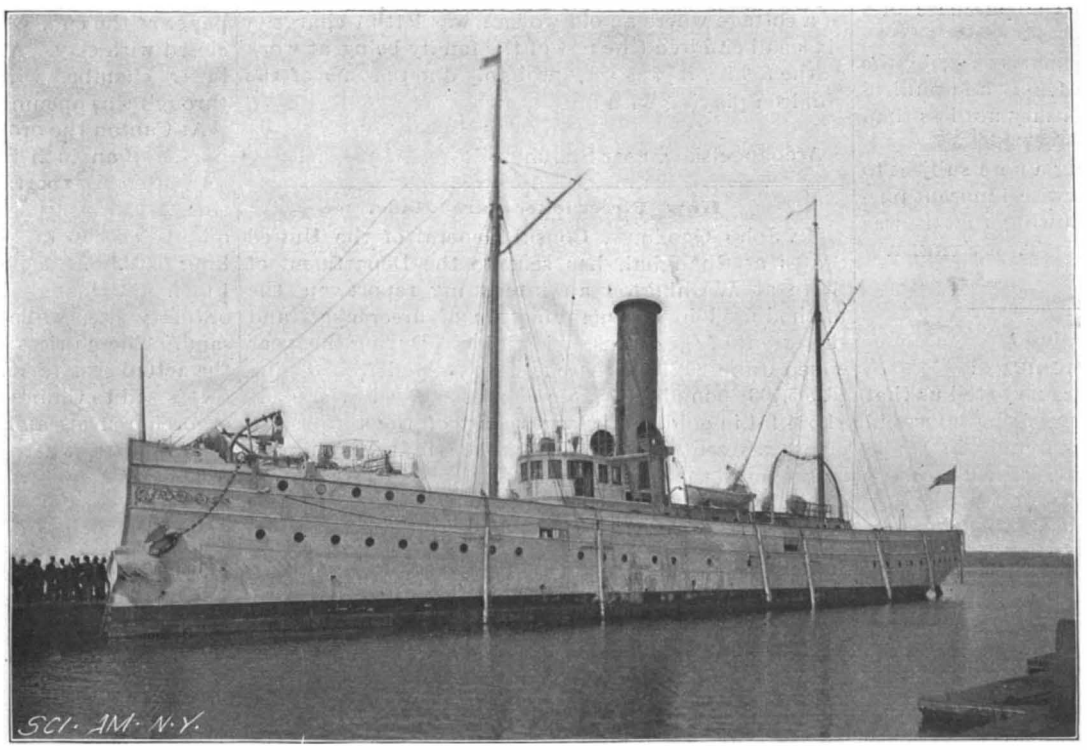
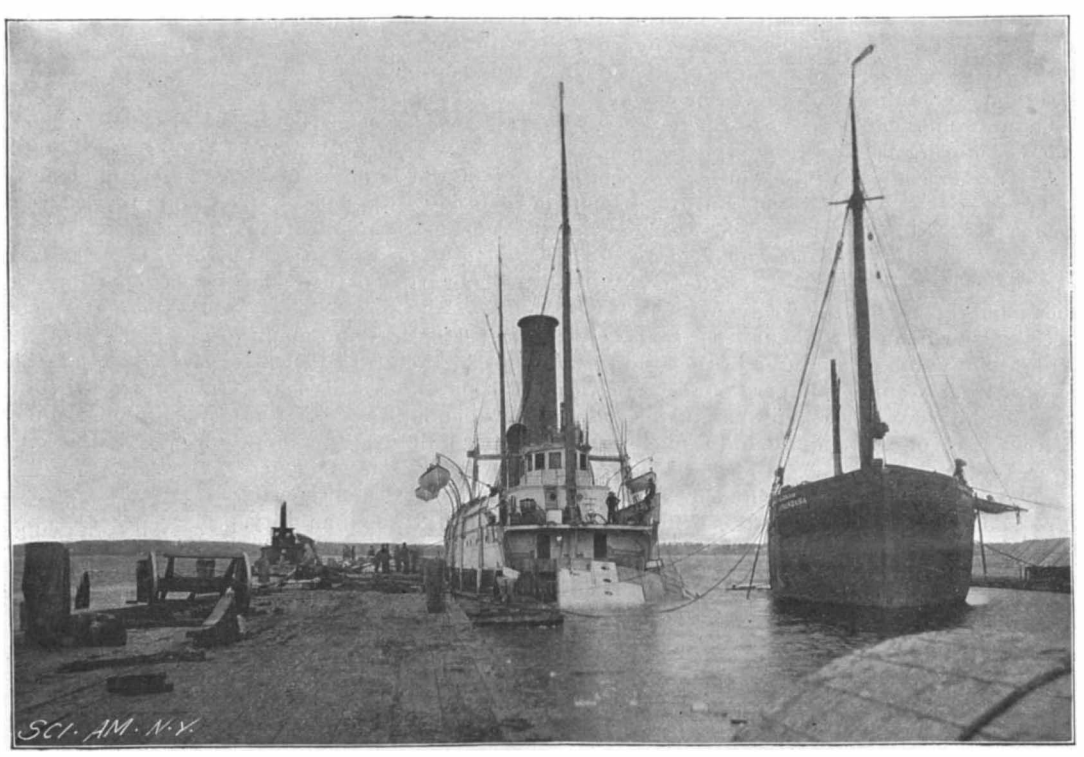
ACCIDENT TO THE REVENUE CUTTER "GRESHAM."

On April 26 the United States revenue cutter "Gresham" stopped at Ogdensburg, N. Y., on her way from the upper lakes to the scene of naval activity. The "Gresham" is 205 feet in length and draws about 12 feet of water. She was built in Cleveland and is very fast. This and other new cutters were transferred from the Treasury to the Navy Department at the beginning of hostilities. The "Gresham" was unable to proceed on her journey on account of her length, which was greater than the locks of the St. Lawrence canals, just below Ogdensburg, and her draught was also greater than the depth of water in the canals. In order to make the journey to Montreal, where she was to be put together again, the boat had to be cut in two, and the draught of the two sections lessened by pontooning. A section of the boat about 35 feet in length was cut from the rest of the boat, the parts were separated, and wooden bulkheads were built across the ends. Each pontoon was secured to the sides just forward of the propeller to lessen the draught of the stern sufficiently, and smaller pontoons were placed under the forward quarter to support and steady the boat section. Before hauling the boat out upon the marine railway, the anchors, chains and other movable things were unloaded upon the deck to lighten the load, and about the first part of the third week in May the boat was replaced in the water and the work of reloading the anchors was about completed when, according to accounts of men of the crew and workmen in the shipyard, all of the heavy articles were loaded upon the upper deck, instead of upon the lighter, which could accompany the boat through the canals. Naturally, the load on the deck made the boat section top heavy, and on Tuesday, May 17, it was noticed to have quite a list to starboard. This list increased rapidly, and was further aided by the breaking loose of a rapid-fire gun mounted in the boat, which was quickly followed by the capsizing of the boat section, which sank in about 35 feet of water between the piers of the dock. In turning over the gun was thrown out upon the dock, as was also one of the anchors. Fortunately, no one was killed and only one man was slightly injured. Had the accident happened some twenty minutes before, the casualties would probably have been many, as some twenty-five men were at breakfast in the section of the vessel which sank, and it is likely that many of them could not have escaped in safety. The forward section which sank weighed about 85 tons, and some of the plates which projected from both sections were badly twisted, owing to the close proximity of the two sections of the boat. The Ogdensburg Marine Railway had the contract for taking the boat to the canals, and they conducted the wrecking operations. An inspection was made since the forward section has been raised, and it disclosed the fact that many of the plates were bent and the vessel was leaking badly. The accident is generally accounted for on the theory that the pontoon on which the section rested was filled with water. This is another theory in addition to the one already advanced. Preparations are in progress for taking the cutters "Algonquin" and "Onondago," now building at Cleveland, through the canals. It is considered that the revenue cutters will not return to the lakes, owing to the fact that they cannot be gotten through the canals without cutting them again. It is probable new cutters will be built for the lakes.



THE UNITED STATES REVENUE CUTTER "GRESHAM," AT OGDENSBURG, N. Y.



ACCIDENT TO THE "GRESHAM" AFTER BEING DIVIDED TO PASS THROUGH ST. LAWRENCE CANALS.

To restore to aluminum its white color, which has become gray, the following is recommended: Dissolve 30 grammes of borax in 1 liter of water and add a few drops of ammonia to the solution. With this mixture wash the articles.—Die Mappe.

Height and Distance from Sea Affecting Climate.

The effect of elevation in lowering temperature depends upon the fact that, as heat is very slowly communicated from stratum to stratum of the air, and as the air is warmed chiefly by the surface of the earth, the lowest layers are the warmest, and the temperature on the tops of mountains is therefore much lower than on the plains below, says The Sanitarian. The difference is, however, far more marked in the day time than at night and in summer than in winter. During severe frosts the conditions are generally reversed, and the temperature rises with height instead of becoming lower, so that a thaw often sets in upon the hills while the frost is still unbroken in the valleys below. If the air were perfectly dry, the rate at which the temperature would fall would be 1° F. for every 180 feet ascent. Inasmuch, however, as the atmosphere contains moisture, which is liable to be condensed by cold, the latent heat given out in condensation diminishes the rate of cooling, so that the rate of lowered temperature, as a general rule, may be taken as 1° F. for every 300 feet in altitude. Solar heat, being the source of all energy, exercises supreme control over climatic conditions. Radiant heat, or the heat radiated from the sun, although possessing great power of warming solid and fluid bodies on which it falls, has little power of heating the air through which it passes. Were it not for the watery vapor contained in the atmosphere, radiant heat would pass through it without raising the temperature. It is the shade heat, or the heat reflected from the surface of the earth, whether land or water, and directly warmed by the radiant heat emanating from the sun, which regulates the temperature of the air. Winds, for example, convey over immense distances the temperature of the regions from whence they arise; while owing to the greater specific heat of water, which is as four to one compared with that of land, water takes longer to warm as well as to cool. Hence, the sea remaining open, except in the polar regions, is constantly modifying the strata of air coming in contact with it, and thus moderates the heat in summer and the cold in winter. It is on account of this specific heat of water that insular climates are more equable than continental, the summers being cooler and the winters warmer.

The Philippines as a Trade Center.

American interest in eastern affairs has witnessed a veritable boom since that memorable first of May this year. That, at least, would seem to be the first conclusion arrivable at, when the immense mass of information regarding Asiatic trade conditions and outlook which has been published is considered. That the basis of much of this very apparent popular demand for information is the thrifty American anxiety to look for possible trade extension in that direction, seems quite evident. That this trade extension may be greatly accelerated by the obtaining of a base in Asiatic waters from which American interests may operate seems likewise accepted. One development of this popular interest is witnessed in the preparation by the Bureau of Statistics of the Treasury Department of a series of tables concerning the trade done between the United States and a number of countries of Asia in the vicinity of the Philippines. Of course, it is well known that the most thickly populated countries on the face of the globe are situated not far from the Philippine Islands, China and British India being citable as notable examples in this latter respect. While, of course, supplies for the vast population that lies within measurable distance of the Philippines, variously estimated at from 800,000,000 to 900,000,000, might not be so valuable or expensive individually as is the demand from our own or European sources, still the vast number of people to be supplied with products, a number of which can be and are made in surplus quantities in the United States, renders any statistics of this character of live commercial interest.

To the group of countries adjacent to the Philippines, including China, British India, the East Indies, Japan, Corea and Asiatic Russia, the exports of the United States are shown to have increased from a sum slightly in excess of $27,000,000 in 1893 to nearly $62,000,000 in 1897, and yet in spite of this growth our shipments to those countries make up less than 6 per cent of their total imports. Most of these imports, too, are of products largely produced in the United States. For instance, Chinese imports in 1896 included $64,000,000 worth of cotton goods, over $4,000,000 worth of woolen goods, large quantities of flour and machinery also being imported. That we have already enjoyed some of this trade seems certain from the fact that the export of cotton cloth from the United States to China increased from 27,000,000 yards in 1893 to 140,000,000 yards in 1897, and our total exports of merchandise to China in 1897 were three times as large as in 1893. Our exports of cotton cloths to British India also show a heavy gain, while to the Dutch East Indies our exports doubled in the four years mentioned, the chief articles of shipment being naval stores and mineral oils. A steady growth in our trade with Hong-Kong, which is the distributing point of that part of the world, shows a gain of nearly 50 per cent over 1894. Perhaps the greatest gain, however, is that shown in our trade with Japan, which in 1897 was more than four times that of 1893. It will be gathered from the above statistics that the Philippines might, under favorable circumstances, possess a value as a commercial center little if any inferior to their acknowledged importance as a military and naval base, and it is, perhaps, not too rash to suggest that Manila might in time even rival Hong-Kong as a distributive trade center.

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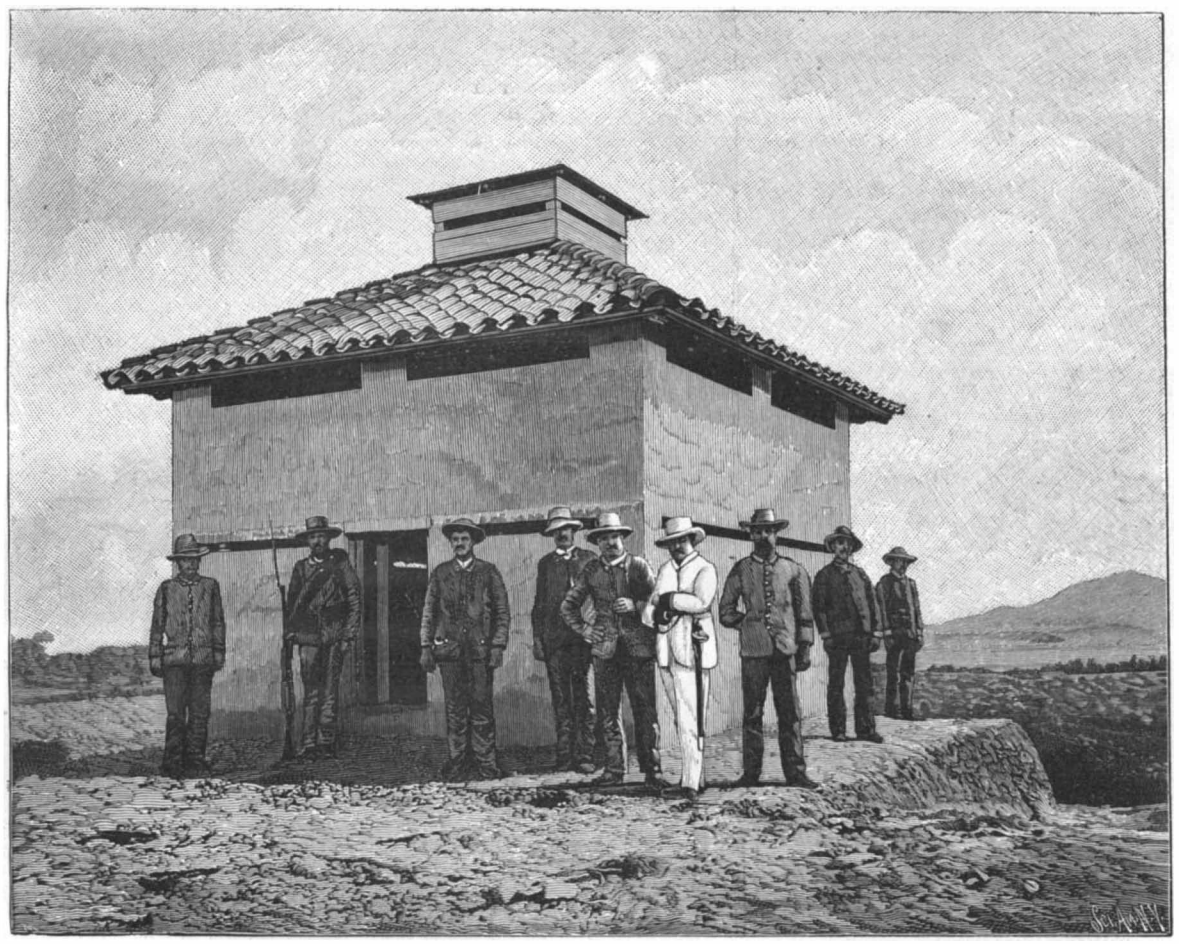
HOW THE SPANISH FORTIFY THE COUNTRY IN CUBA.

The Spanish soldiers have not had many encounters in battle with the Cuban insurgents, as, owing to the peculiar nature of the surface of the land in Cuba, a small force is capable of holding a much larger force at bay when such methods of guerrilla warfare are adopted as are used by the Cuban insurgents. The armies of Spain have been perpetually harassed by the enemy, and as the Cubans would not meet them in the field they have devoted their attention very largely to attempts to cut off the various sections of the island to prevent the mobilization of large bodies of insurgent troops; to "reconcentration," by which they hoped to starve the Cuban forces by shutting up in the towns the peasants who furnished them with food, and to the protection of large estates and plantations.

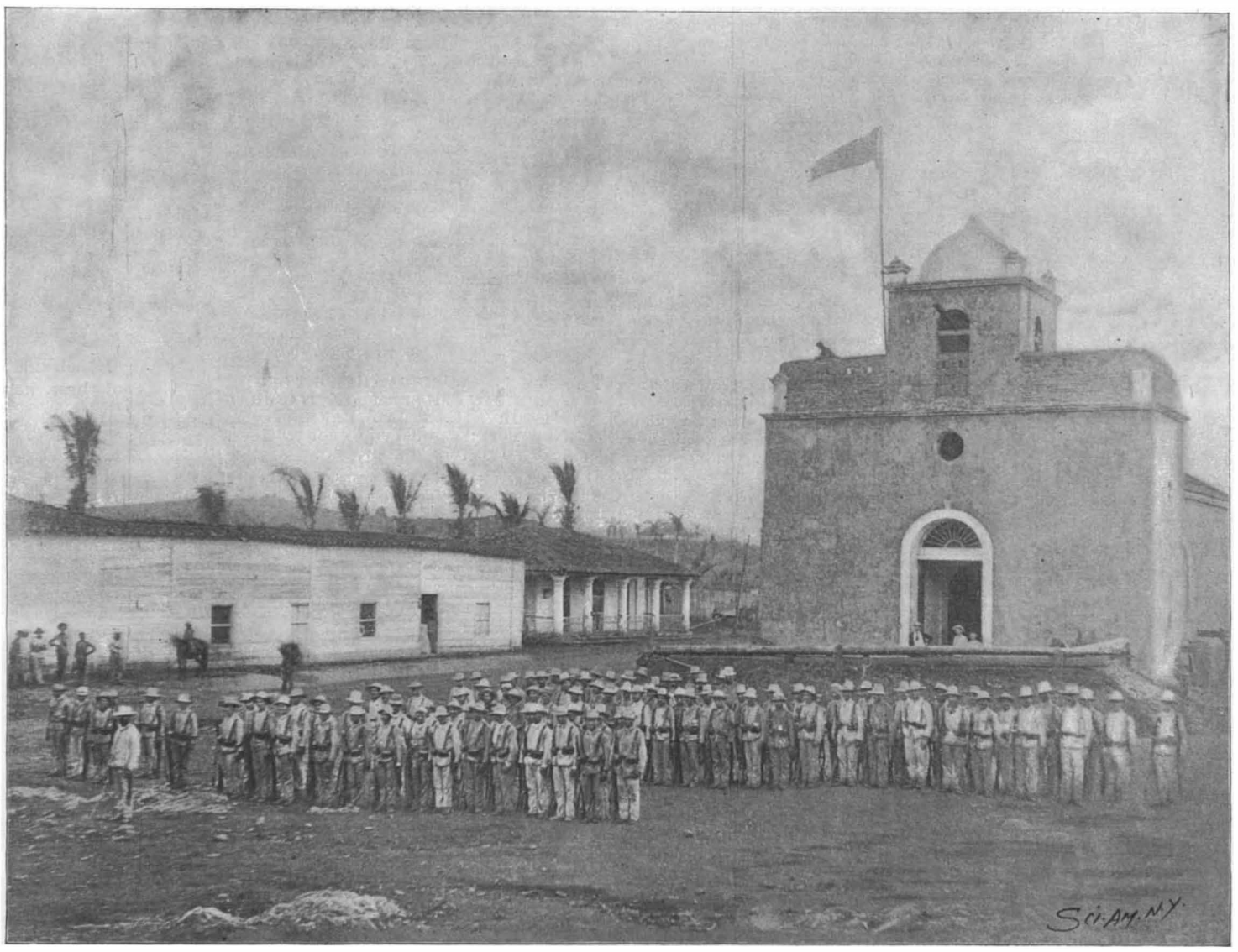
Our two engravings show the class of defenses which our troops will encounter. The square fort (Fort Paez, Santa Clara), shown in our cut, is an adobe structure provided with a tiled roof, suggested by the experience of the last war, 1868–1878, when the insurgents used to fire arrows with inflammable material on the roofs of the forts, setting them on fire. Broad horizontal slots are provided, through which the Spanish troops can fire. Such a fort is, of course, very formidable for the insurgents, but the United States troops, with their modern artillery, will convert it into a slaughter house in less than a minute. Such forts are frequently found along the two "trochas" and along the railroads.



FORT PAEZ, SANTA CLARA, CUBA, HELD BY SPANISH TROOPS.

It might be well at this place to describe the "trochas" which were built by the Spanish to confine the insurgents within certain districts. There are two of these fortified lines, but one of them is ineffective. This is the one intended to prevent the Cubans in the province of Pinar del Rio from moving on Havana. A road wide enough to permit of cavalry to pass is bordered on each side by two ditches, three yards wide and three yards deep. On the outside of these two trenches is a well-stretched barbed wire fence, which was to oppose a serious obstacle to the cavalry of the insurgents. Beyond the two trenches they dug wolf traps twenty yards apart. About one hundred yards apart they built some block houses, whose walls were made of thick planks a yard apart. The space between the walls was filled with sand. At night this fortified line was lighted with electricity and 12,000 men were concentrated on it. Yet, in spite of these precautions, Maceo passed it twice, the barbed wire afforded no protection, being easily cut by the machetes. In the "trocha" in the province of Puerto Principe the forts are of the type shown in our engraving, and a military railroad follows the fortified line across the island and makes the rapid concentration of troops comparatively easy.

Our other engraving shows the fortified church of La Palma, Pinar del Rio. In this case the local church has been strongly fortified, and this would also prove a very effective barrier to the insurgents, who have little or no artillery, but with our modern guns we could destroy the fort in a very short time, and destruction would come to all those who attempted to hold this fortification. The soldiers in front in both cases are Spanish soldiers, and from them we can see the type of men with whom we have to contend.



FORTIFIED CHURCH OF LA PALMA, PINAR DEL RIO, CUBA.

MR. BORCHGREVINK has given to a representative of Reuter's Agency some details of the arrangements for the Antarctic expedition which will shortly leave for Australia and South Victoria Land. He said that his ship, the "Southern Cross," has been designed by the builder of the "Fram," and has 10 feet of solid oak at her bows, and at her weakest point is 32 inches in thickness. Over all she is sheathed with 3 inches of American greenheart — a wood which never splits, and is very hard and slippery. The "Southern Cross" will fly the British flag, and will leave London in July. A pack of sixty-five Siberian sledge-dogs will be taken, and a number of sledges for the inland journey on the South Victorian continent. The object of the expedition is to explore South Victoria Land, and to investigate the seas and islands between there and Australia. Mr. Borchgrevink is taking with him stores for three years and a supply of carrier pigeons.

LOS ANGELES, California, has set a good example by the enforcement of an ordinance forbidding the free delivery from house to house of samples of proprietary or other medicines. Numerous children have been made deathly sick (and on two or three occasions, in various parts of the country, fatally poisoned) by getting hold of these samples and eating them.

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RECENTLY PATENTED INVENTIONS.

Bicycle Appliances.

BRAKE.—Frank H. Mayer, Denver, Col. The object of this inventor is to provide a brake which may be quickly applied by the rider by tilting the seat or saddle, thus obviating the necessity of using the hands or feet to stop the wheel. The brake comprises a clip provided with a tubular portion having opposite openings and a rocking-shaft mounted in the tubular portion of the clip, the seat-spring being adapted to be secured in the rock shaft and project through the openings of the tubular portion of the clip. By throwing his weight on or toward the rear portion, the rider causes the rocking shaft to operate the brake. The device is applicable to all kinds of vehicles.

CHAIN-ADJUSTING DEVICE. — Alexander Pinover, New York city. In this invention the connection between the rear fork member and the lower brace is provided with a circular opening into which disks are designed to engage. Each disk has an opening eccentric to its center, the opening of one disk registering with another. Each disk has an annular flange to engage against the outer surface of the connection. Means are provided for clamping each pair of disks together. To adjust the tension of the chain, the disks are rotated in their bearings, thus acting on the sprocket, and after adjustment they are clamped in place. By taking hold of the step the disks on both sides may be simultaneously operated, connections having been provided for that purpose.

COIN-OPERATED LOCK FOR WHEELS.—Erich Schmidt and Adolf F. Schneider, New York city. The object of this device is to provide means whereby a bicycle rider may securely lock his wheel by dropping a coin into a proper receptacle. The casing of the device comprises a keeper provided with a gate. A lock is carried by the casing, the bolt of which is adapted to engage the gate of the wheel-keeper. A lock-lever prevents the withdrawal of the key from the lock and is adapted to receive a coin from a coin-receptacle. A plunger is arranged to move the coin in a direction to raise the lock-lever from the key so as to enable the wheel to be removed.

Railway Improvements.

RAIL-JOINT AND NUT-LOCK.—Michael Mullins and Cephas Fleming, of the United States Army. This rail-joint fastening and nut-lock has angle-iron fish-plates with a foot extending beyond the rail-base down toward the tie and with spike-receiving notches in the outer edge. One of these plates has squared bolt-head recesses about its bolt-holes and the other plate has an outwardly-projecting rib or lip at its upper edge. A nut-locking-plate fits the angle of the latter fish-plate with its upper edge beneath the rib or lip and has squared recesses adapted to receive the nuts on the bolts, the walls thereof being removed to expose the upper outer corners of the nuts. The lower flange of the nut-locking plate has notches corresponding with those in the fish-plates to receive the spikes, and also has an under concave groove extending longitudinally, which permits the plate to yield and prevents the spikes from being pulled out.

FOG SIGNALING APPARATUS FOR RAILWAYS.—Herbert Tomlins, London, England. The improvements in this apparatus have for their objects to render the operation and firing of the fog-signaling apparatus automatically dependent on the position of the semaphore signal, to guard against two or more signals being fired in succession by the same train and to guard against the danger of a misfire. The explosive signaling apparatus is provided with a revolving cartridge-holding disk having pairs of cartridge holding chambers or barrels arranged circularly. The two members or barrels of each pair are on the same radius. A breech-block is common to the two chambers or barrels and is hinged to swing outwardly toward the circumference when opened. Firing-pins for the barrels are yoked together and a firing-hammer is adapted to act on both firing-pins.

PNEUMATIC SWITCH-THROWING MECHANISM.—George R. Bartholomew, Ridge, Pa. This switch-throwing mechanism is operated by compressed air, and is controlled by the engineer from a moving locomotive. The mechanism comprises a cylinder connected to the switch points to operate them in either direction, a piston connecting the mechanism with coupling members located along the track, and a check-valve between the cylinder and each of the coupling members. A releasing valve is located in the air-cylinder, set to open at a pressure below the working presure and to close by the working pressure. Means are provided whereby the connection may be temporarily made from an air-supply on the engine to the pipes leading to the cylinder.

Engineering.

ROTARY ENGINE.—Alejandro Stephens, Guadalajara, Mexico. The engine of this inventor consists of a cylinder in which a segmental abutment is loosely mounted and formed with sections at its steam-pressure end, the sections having their ends oppositely inclined and the end of one section bearing upon the end of another section. The cylinder is mounted in a tubular hub having steam-chambers formed in its inner walls. These chambers have communication with the interior of the cylinder. Piston-valves in the cylinder are adapted to engage over the inner ends of the communications. A tubular valve in the hub portion has steam inlet and exhaust ports. Means are provided whereby the movement of the piston-valves imparts a rocking movement to the tubular valve.

Electrical Improvements.

SIGNALING DEVICE.—Frank B. Taylor, Edgar E. Salisbury and Albert E. Dean, Tacoma, Wash. The purpose of this invention is enable a central operator to turn in automatically any one of a number of call-boxes desired on a single circuit and at the same time to signal the subscriber without disturbing or signaling any other subscriber on the circuit. Means are also provided for testing the outlying-boxes from the central station. The apparatus is provided with an indicator-wheel having a series of holes near its circumference, and a series of pins extending radially from the circumference, the number of pins being equal to that of the number of holes. A plug is inserted into any one of the holes and a spring-contact plate in the main circuit is adapted to be moved by the plug to break the circuit. An armature-lever is actuated by the current through the main circuit, and forms part of a local circuit. This armature-lever forms a circuit-closer for the local circuit and also provides a stop for the indicator wheel by engaging with one of its pins. An electro-magnet is located in the local circuit and coacts with a motor armature-lever. A ratchet wheel is carried by the indicator-wheel. Spring-pressed ratchet-bars are pivotally connected to extensions from the motor armature lever and engage with the ratchet wheel.

INCANDESCENT LAMP. — Otto H. Michaelson, Charleston, W. Va. The object of this inventor is to provide a lamp in which the globe and its base may be separated for the purpose of cleaning or replacing a broken filament with a new one, and then assembling the parts. In this lamp the base, which is composed of insulating material, has an annular groove in its outer end and is secured in a metal shell. Conducting wires extend through the base piece and a ring of insulating material is located in the shell. On this insulating-ring a metal ring is mounted and is connected to one of the wires. The other wire connects with another metal ring in the insulating ring. The globe has a channel around the wall of its open end, which is engaged by a packing ring in the groove of the base. A sufficient bending pressure separates the parts at the packing joint. After cleaning or replacing a carbon, the parts may be assembled.

Miscellaneous Contrivances.

FLUSHING APPARATUS.—Henry Haynes, Philadelphia, Pa. In this apparatus a water-supply pipe leads into a tank provided with an opening at the bottom. A plate having a valve-seat is supported within the tank above the opening, forming a cap for the outlet end of the supply pipe. A discharge pipe is fitted in the tank-opening and is provided at its top with an apertured cap having a valve-seat formed therein. Connected valves are provided, one valve being arranged to close the outlet for the water-supply pipe and the other valve being arranged to close the inlet of the discharge pipe. One valve seats when the other is unseated. A pull-rod is connected with the valve whereby the valves are operated.

FILE AND BINDER.—Adolph A. Hunziker, St. Louis, Mo. This invention is adapted for use in account books employing a series of separate leaves. The object of the invention is to improve the construction of the fasteners for the leaves, whereby the latter may be conveniently and quickly removed. The file and binder comprises covers connected by a back and fasteners for the leaves arranged on one of the covers adjacent to the back. The fasteners consist of bent or curved members pivoted together in a recess in the cover and having interlocking engagement at their free ends.

SUSPENDER CLASP.—John V. Janin, Goldbasin, Wash. This suspender clasp comprises two clamping members slotted at like ends and hinged together near their opposite ends. A coiled spring engages with its limbs the members near their hinge to spread them normally apart. A detent hook on one member is adapted to be brought into engagement with an edge of the other member to hold the two members in clamped position against the stress of the spring. The clasp grips the edge of a trousers waistband and without injury holds the garment in connection with a pair of suspenders.

HANDLE.—Frederic Read, Brooklyn, N. Y. According to this invention, a handle is pivoted eccentrically on a bail and has a preponderance of material on the same side of the pivot as the center. The material is so disposed that the diameter through the pivot shall be longer than a line drawn through the handle at the pivot perpendicular to the diameter, whereby the fingers of the user have a purchase to press inward on the diameter to hold the bail adjacent to the palm.

OIL-WELL TUBING ATTACHMENT. — Andy C. Smith. Sigel, Pa. This invention is an improvement in oil-well apparatus and in connection with the ordinary packer usually employed in gas-producing wells, provides means by which a discharge of the sediment is secured from above the packer before removing the latter. The improvement comprises a packer having a left-hand thread on its upper end. The tube is fixed to and projects upward from the packer and is provided at its upper end with a downwardly facing shoulder. The tube has an opening and the cover-sleeve sliding on the tube is provided at its lower end with a left-hand thread to engage that of the packer. This sleeve has, furthermore, at its end an internal upwardly facing shoulder to engage that at this upper end of the tube. The cover-sleeve being independent of the packer, it may be moved without affecting the packing operation.

VIOLIN OR MANDOLIN CITHERN.—Alexander Wascinski, Jersey City, N. J. This instrument is similar to a violin in that it is played with a bow and to a mandolin in that the strings are picked and sounded in quick succession. The instrument is provided with a bow guide extending transversely of the strings on one side. Movable dampers normally engage the strings on the other side. Means are provided for removing the dampers from the strings. The bow used consists of a toothed strip of soft rubber carried by a body. The teeth of the bow produce by their engagement with the strings the mandolin effect.

TRIANGLE.—Benjamin W. Trunk, St. Joseph, Mo. In this drawing-triangle an opening extends through the hypotenuse from the outer to the inner edge thereof and into an adjacent side. An edge or section is hinged to the triangle at one of the acute angles. A pin is located in the opening of the hypotenuse. A protractor is carried by the hinged edge or section and is fitted to slide in the openings. This protractor is formed at its free end with a lug which engages with the previously mentioned pin to limit its outward movement. A spring in the opening of the hypotenuse bears against an edge of the protractor and a thumb-screw in the latter side may be made to cause the spring to press upon the protractor to hold it in adjusted position.

DUMPING SCOW. — Natt Stickney, Bradford, Mass. This dumping scow is provided with a well open at the bottom. A receptacle is pivoted at its ends in the hold and has its discharge side arranged to overbalance the opposite side, so that upon releasing the receptacle from a normal position it will automatically turn on its pivots into a dumping position and discharge the load. Means are provided for locking the receptacle in a dumping position.

HOSE-SUPPORTER. — Dora Harrison, Lansing, Mich. The purpose of this invention is to provide a hose supporter which can be quickly and easily adjusted to attach or release the hose. The invention consists essentially of an attaching device provided with an eye, a loop hung in the eye, a pneumatic ball and a link connecting the ball with the eye.

APPLICATOR.—Cyril P. Brown, Spring Lake, Mich. This instrument comprises a cylinder, a spindle held against end movement in the cylinder, a plunger mounted to travel on the spindle and a tube secured at the outlet of the cylinder having ports in its sides near its outer end. A cap is mounted on the tube, has a closed outer end and is provided with similar ports in its sides capable of being brought into register with the ports in the sides of the tube.

CLOSURE FOR COUPLINGS. — Joseph Muhr, Dunkirk, N. Y. The object of this invention is to provide a closure for unused couplings to prevent the passing of dust, cinders, etc., into the train pipe, triple valves and other parts, and to prevent twisting of the coupling-hose. The closure comprises an arm mounted to swing, and formed with a spring-pressed cap having an upwardly turned flange. As soon as the coupling members are separated, the spring swings the arm and its cap over the opening in the member to which the device is attached.

Designs.

ANTI-RATTLER. — Frank P. Johnson, Danville, Pa. This patent relates to the shape of the wire body of the well known Johnson Anti-Rattler. The design provides for a curved loop that bears on the thill-iron, hooks or eyes at the opposite ends for carrying a yoke that engages the axle-clip and intermediate spring-coils.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for 10 cents each. Please send the name of the patentee, title of the invention, and date of this paper.

NEW BOOKS, ETC.

DIGEST OF DECISIONS OF LAW AND PRACTICE IN THE PATENT OFFICE OF THE UNITED STATES AND STATE COURTS, IN PATENTS, TRADEMARKS, COPYRIGHTS AND LABELS, 1886 to 1898. By Amos W. Hart, of the Bar of the District of Columbia. Chicago: Callaghan & Company. 1898. Sheep. Pp. 385. 8vo. Price $6.50 net.

Mr. Hart's digest combines under one cover the decisions of the Federal Courts, the Commissioners of Patents and of the State Courts, and in this respect is an improvement over prior works and will be of great assistance to the profession, as well as to inventors and the owners of patents and trademarks. The sources chiefly drawn upon by Mr. Hart are the Official Patent Office Gazette, unpublished decisions of the Commissioner of Patents and the Federal Reporter. The work includes critical and historical notes which in many cases serve to link the present with the former practice and in a large measure dispense with a more extended research. The index contains upward of five hundred chief titles and nearly double the number of sub-titles, which evidences the scope of the work. Mr. Hart's long experience dictated the new classification adopted by him, which is designed to facilitate reference to the different subjects within the wide range of the work.

TWENTY-NINTH ANNUAL REPORT OF THE AMERICAN MUSEUM OF NATURAL HISTORY, CENTRAL PARK, N. Y. New York: Published by the trustees. 1898. Pp. 127. Paper, 8vo.

Besides the reports that inevitably find place in publications of this character, there appear a series of valuable notes regarding the scientific explorations now in the field as the result of the enterprise of this institution, and also of explorations that are expected to be undertaken in the near future. There are the usual lists of exchanges, donations, purchases, etc., and a number of interesting illustrations of objects (fossil) now in the museum.

ANGEWANDTE ELEKTROCHEMIE. Dritter Band. Organische Elektrochemie. Von Dr. Franz Peters. 13 Bogen Octav. Mit 5 Abbildungen. Verlag von A. Hartleben, Wien. Paper, $1.

The third volume of Dr. Peters' "Applied Electro-Chemistry," now lying before us, shows the same general excellence of treatment and the scholarly qualities so characteristic of the first two volumes. Steadily the author has kept in view the plan he adopted in the previous portions of his work. Nothing has been omitted which beare even remotely on the electro-chemist's art. Innumerable authorities are constantly referred to and cited in the many foot-notes. The chemistry of carbon, which essentially constitutes organic chemistry, by reason of its extremely involved reactions, presents difficulties to the electro-chemist far greater than those of inorganic chemistry. It is the purpose of this volume to remove whatever doubts may exist in the chemist's mind on various phases of the subject and in clear, terse language to explain the chemical changes which accompany many of the reactions. Important as the results hitherto obtained may be, nevertheless, we may be permitted to hope that the future successes of electro-chemists may be productive of even greater and richer benefits than those of the past.

Business and Personal.

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Notes & Queries

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References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
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Scientific American Supplements referred to may be had at the office. Price 10 cents each.
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(7457) J. D. asks: Would it increase or diminish the power of a double engine 8 inches by 10 inches, with driving band wheel 54 inches in diameter, 12-inch face, driving a 24-inch pulley, by using a smaller diameter band wheel? If so, in what proportion? A. At the same engine speed, you will diminish the power delivered by making the band wheel smaller. If you run the engine faster, to give the same speed to the second shaft, the power will be the same; all in consideration of the same quantity of steam used in both cases. A larger amount of steam used by using the same cut-off and full throttle will give more power under the higher speed.

(7458) W. C. L. asks: If the measured resistance of a line is 130 ohms, how many cells of battery giving an output of 1½ volt ½ ampere will it take to work four 150 ohms relays? Making the total resistance 730 ohms. What is the base of calculation? Should the internal resistance be greater than the external, and why? A. The number of cells required to work your line depends, not so much on the resistance of the instruments as on the number of turns of wire in the relay magnets. As relays are usually wound, you will probably require 6 to 8 cells. The external resistance of a circuit should be much greater than the internal resistance of the battery, if you would have your battery last any time. When these two resistances are equal, the battery gives its largest current, but runs down very fast.

(7459) E. M. asks: How can I produce a plane, polished surface on mineral specimens, to show the color and texture of the mineral? A. If the mineral is hard, it may be reduced to a plane surface by means of a carborundum wheel, kept wet with water, or by rubbing it on an iron plate supplied with carborundum in the form of a coarse powder, kept wet. It may be smoothed with a finer carborundum wheel or with finer powder and finally polished with rouge or putty powder and water applied with a pitch lap.

(7460) A. P. Y. says: Some years ago I saw an answer to one of your correspondents how to detect sewer gas. As I remember it, some chemical was exposed in a vessel, and, if sewer gas existed, it became discolored. Can you give directions for making the test? A. 1. A suspected joint in a sewer or drain pipe may be tested by wrapping it with a single layer of white muslin, moistened with a solution of acetate of lead. As the gas escapes through the meshes of the cloth it will be blackened by the sulphur compounds. 2. It is usual to detect gas escapes by applying a lighted taper or candle to the suspected place of leakage. This is dangerous, and many explosions have thus been occasioned. A safer mode is as follows: Mix dark soap and water in the proportion of 2 pounds of the former to 5 or 7 pints of the latter. The sticky paste or liquid so obtained is ready to be applied by the brush to the gas pipe, when, if an escape is taking place, bubbles will readily be seen on the liquid; thus the positions of the gas escapes are indicated without any danger.

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